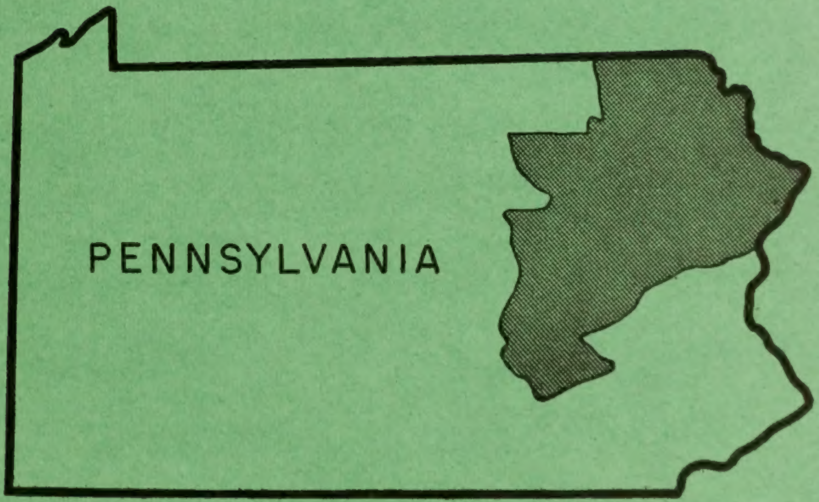
Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

84M
Cop 4

The Anthracite Forest Region
A Problem Area

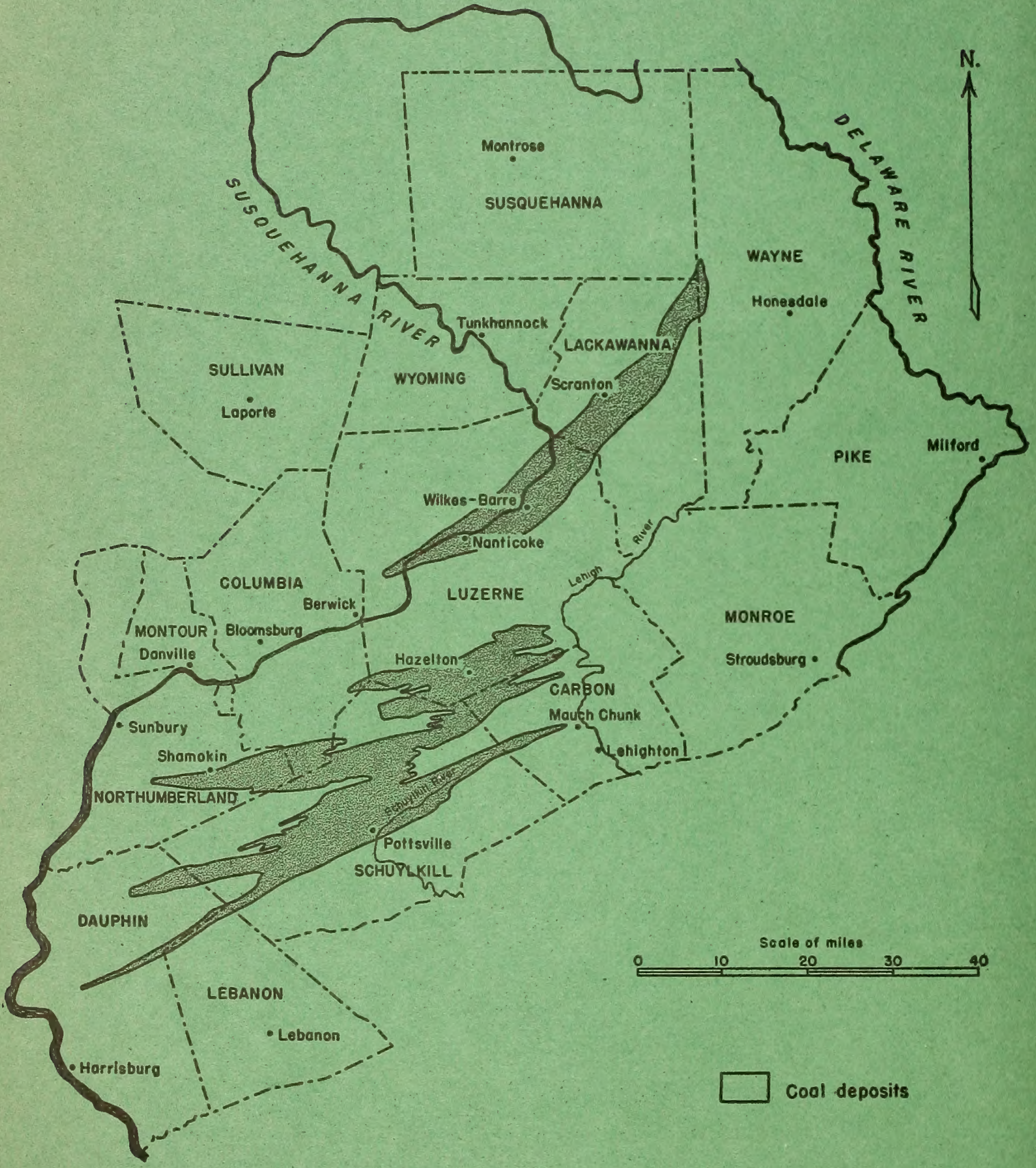


LIBRARY
CURRENT SERIAL RECORD
AUG 19 1948
U. S. DEPARTMENT OF AGRICULTURE

FOREST SERVICE

United States Department of Agriculture

Miscellaneous Publication No. 648



THE ANTHRACITE FOREST REGION OF PENNSYLVANIA

UNITED STATES DEPARTMENT OF AGRICULTURE

MISCELLANEOUS PUBLICATION NO. 648 JUNE 1948

The Anthracite Forest Region

A Problem Area

by FRANK A. INESON, *forest economist*
and MILES J. FERREE, *forester*

NORTHEASTERN FOREST EXPERIMENT STATION
FOREST SERVICE

UNITED STATES GOVERNMENT PRINTING OFFICE - - WASHINGTON, D. C. 1948

FOR SALE BY THE SUPERINTENDENT OF DOCUMENTS, WASHINGTON, D. C. PRICE 40 CENTS

Acknowledgments

MANY INDIVIDUALS and agencies collaborated in the forest survey that provided material for this publication. Special acknowledgment is made to Clement Mesavage and R. D. Forbes, formerly of the Allegheny Forest Experiment Station, who organized and initiated the project; to Dr. Hardy L. Shirley, former director of the Northeastern Forest Experiment Station, who gave constant encouragement and counsel; to Earl J. Rogers, of the Northeastern Station, who helped develop aerial photo interpretation in this region; and to Donald F. Robinson, who gave editorial assistance in preparing the report. Thanks for their advice and assistance are also due to J. Arthur Bolender, secretary, and Stanley Mesavage, former industrial forester, of the Wyoming Valley Chamber of Commerce; and to the personnel of the Pennsylvania Department of Forests and Waters and the State Planning Board.

Foreword

SOME AREAS in the United States are fortunate in having ample jobs for all workers. Others, even in times of prosperity, have more job hunters than jobs; in times of depression, poverty becomes so acute that it threatens the national welfare.

The Anthracite Forest Region of northeastern Pennsylvania is one such problem area. During the 1930's unemployment in this region was especially severe. In 1938, when the relief load was at its peak, 364,000 persons—nearly a quarter of the total population—were dependent on public-works programs and direct relief. In that same year the figure for the rest of Pennsylvania was 16 percent.

This situation, though aggravated by the general depression, was due largely to specific local conditions. During the preceding 20 years the production of anthracite coal—the most important source of employment in the region—had fallen off 50 million tons, or 50 percent. Furthermore, a reduction in markets and in the amount of recoverable coal make any considerable increase in production improbable.

During the war, unemployment in the region temporarily disappeared. But the basic situation still exists, and only a major readjustment of the region's economy can prevent serious unemployment in the future.

Next to coal, the most important natural resource is the forest. Of the 5¼ million acres that comprise the region, 3¼ million are forested. Though in poor condition now, these forests were once among the finest in the country, and their potentialities are still great.

This report has been organized in two parts. Part I describes the general economic situation in the Anthracite Forest Region and discusses the past use and misuse of the forests as an aid to understanding current conditions. The potential contributions of the forests to employment and income are estimated, and suggestions are made for needed action programs. Part II describes in detail the situations in the three principal subregions.

Highlights of the Anthracite Forest Region's economic problem and the potentialities of the forest resource for helping to meet this oɹdblem are presented graphically on the next two pages.

THE PROBLEM

1940

632,000 WORKERS

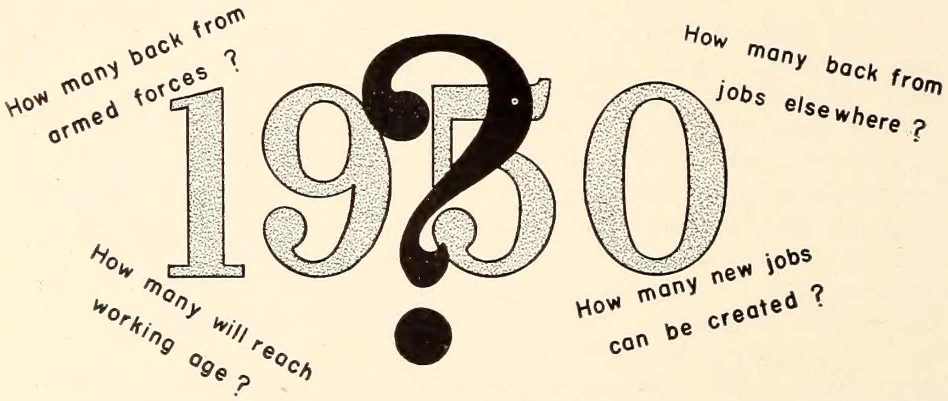
463,000 JOBS

169,000 jobless

145,000 went into the armed forces
70,000 went to work elsewhere
77,000 reached working age
493,000 workers
493,000 jobs

1945

Jobs for everyone


1950
?
How many back from armed forces ?
How many back from jobs elsewhere ?
How many will reach working age ?
How many new jobs can be created ?

There may be 639,000 workers

There may be 527,000 jobs

There may be 112,000 unemployed.

THE OPPORTUNITY

THE FOREST SITUATION

30,000 acres	**BURNED OVER**
200,000 acres	**NEED PLANTING**
35,000 acres	**CLEAR-CUT**
2,406,000 acres	**UNMERCHANTABLE**

CALLS FOR IMMEDIATE ACTION:

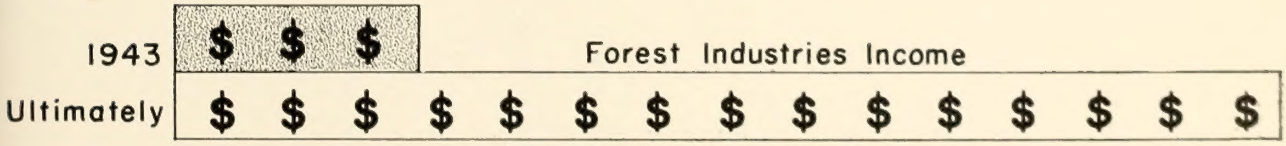
PREVENT FOREST FIRES

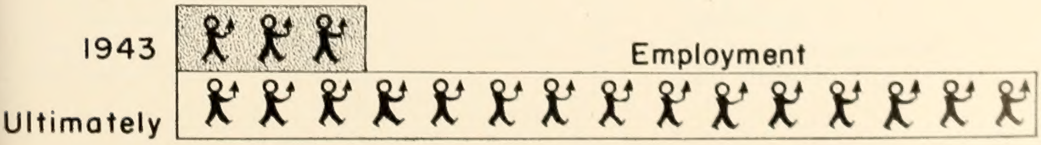
PLANT WASTE AREAS

STOP CLEAR-CUTTING

IMPROVE TIMBER STANDS

THESE MEASURES COULD ACCOMPLISH:





Contents

PART I.—THE ANTHRACITE FOREST REGION

Page

- General description 1
  - Topography and drainage 1
  - Land use 1
  - Industrial development 1
  - Population and employment 2
- Misuse of the forests 6
  - Early exploitation 6
  - Effect of mining operations 7
    - Clear-cutting practices 7
    - Unused areas near towns 7
    - Mine waste banks 8
    - Surface strippings 8
  - Fires 9
  - Floods and landslides 9
- Attempts at improvement 10
  - Fire control 11
  - Reforestation 11
  - Timber management 12
    - State agencies 12
    - The Extension Service 12
    - Cooperative Farm Forestry 13
    - Forestry by farmers 13
    - Coal-company forestry 14
    - Other private owner 14
  - Flood control 14
  - Recreation 15
- Forest industries 16
  - Value of products 16
  - Forest-industry employment 17
  - Wood required for mining 17
  - The lumber industry 19
  - Farm woodlands 19
- The present forest situation 20
  - Condition of the forests 20
    - Unmerchantable stands 20
    - Merchantable pole-timber stands 21
    - Merchantable saw-timber stands 21
  - Major forest types 22
    - Sugar maple-beech-yellow birch 22
    - Aspen-gray birch-pin cherry 22
    - White pine-hemlock 23
    - White pine-white oak-red oak 23
    - Red oak-black oak-white oak 23
    - Chestnut oak 24
    - Scrub oak 24

PART I.—THE ANTHRACITE FOREST REGION—Con.

- The present forest situation—Continued Page
  - Current growth and drain 24
    - Growth 24
    - Commodity drain 25
    - Drain due to fire, insects, and disease 25
    - Inventory change 25
    - Prospects for the next 10 years 26
- The forest potential 26
  - The forests can be built up 27
    - Forest area 27
    - Timber volume 27
    - Forest growth 28
  - Future forest-products industries 28
  - Ultimate employment and income 28
- A program for immediate action 28
  - Intensify fire protection 29
  - Plant waste areas 29
    - Unused areas near towns 29
    - Mine waste banks 29
    - Surface strippings 29
    - Unused farm land 29
  - Improve timber stands 30
  - Improve watersheds 30
  - Public and private responsibility 30
  - Employment required 31
- A long-range program 31
  - Extending public aid 31
    - Financial assistance 31
    - Forest research 32
  - Extending public ownership 32
  - Minimum standards for private management 32
  - Expansion required 32
    - Public agencies 32
    - Private agencies 33
  - Cooperation for effective action 33

PART II.—ECONOMIC SUBREGIONS

- General description 34
  - Forest-land ownership 34
  - Present forest management . . [illegible]
- The coal fields . . . . [illegible]
  - Subdivisions . . [illegible]
  - Forest-products industries 38
  - Land ownership 38

The coal fields—Continued Page
- Forest description 38
  - Condition 39
  - Types and species 40
- Growth and drain 41
- Potentialities 41

The farming areas 42
- Subdivisions 43
- Forest-products industries 43
- Land ownership 43
- Forest description 44
  - Condition 44
  - Types and species 45
- Growth and drain 46
- Potentialities 48

Page

The extensive forests 48
- Subdivisions 49
- Forest-products industries 49
- Land ownership 49
- Forest description 50
  - Condition 50
  - Types and species 51
- Growth and drain 52
- Potentialities 52

References 53

Appendix 55
- Survey procedure 55
- Definitions of terms used 57
- Supplementary tables 60

Part I.—The Anthracite Forest Region

GENERAL DESCRIPTION

THE anthracite coal deposits of Pennsylvania lie in the northeastern part of the State. Because the mining of these deposits requires the use of large quantities of timber, forest operations for a considerable distance on all sides of the coal fields are determined by the needs of the anthracite industry. A small quantity of the wood used by the mines is imported from other parts of the country, from New York, Maryland, Virginia, and even North Carolina. Most of it, however, comes from the 15 counties that include and surround the coal fields. In forest utilization this area forms a unit, the Anthracite Forest Region, shown on the cover.

Topography and Drainage

This region comprises about 5¼ million acres, or 18 percent of the area of Pennsylvania. The topography is generally rugged (fig. 1). In the north is the eastern end of the Allegheny Plateau. This is the deeply eroded remains of a tableland, in some places very uneven, in others relatively level, much of it dotted with small glacier-formed lakes and swamps. The higher ground is mostly rock-strewn with a comparatively thin soil covering; but many of the gullies and valleys have deep, rich soil. The southern part of the region is partly rolling foothill country, well watered, and much of it fertile. Lying across this and joining the Allegheny Plateau on the east is the upper end of the Appalachian chain, a series of steep parallel ridges, widening out in places into relatively infertile plateaus, and separated from one another by narrow valleys.

The eastern and southeastern parts of the region drain into the Delaware River, which bounds the area on the east; the remaining parts are drained by the Susquehanna River, the north branch of which winds down across the center of the region.

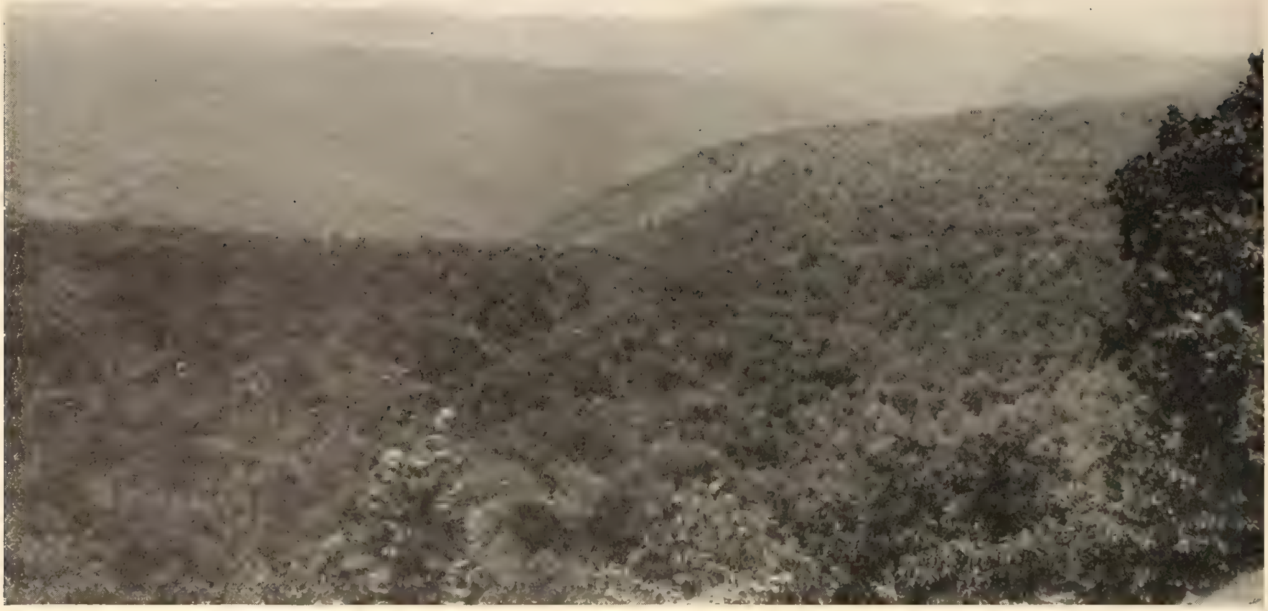
Land Use

About 61 percent of the region is in forest (fig. 2). The proportion of forest land is 25 percent higher than in the rest of the State. The water area, most of which is in the forested sections, is relatively large; 40 percent of the water area of the State is located here. Mine waste banks are to be found wherever mining is carried on. There is considerable open pasture land, especially in the north, much of it in close association with forest. Urban areas given over to residential and industrial uses are located principally along the river valleys, though some of the mining towns in the central and southern part are on the higher land. The area devoted to each of the principal land uses is as follows:

	Acres
Forest	3,198,400
Cropland	1,059,500
Mine waste	60,100
Water	73,900
Other uses	861,500
Total	5,253,400

Industrial Development

Coal mining is the keystone of the economy (fig. 3) of this region. The mines provide the chief market for the forest products. The transportation system was built up to transport coal, which is still its principal cargo. Much of the metal industry is concerned in normal times with manufacturing [illegible] for the mines and rolling stock for the railroads [illegible]



F-447479

FIGURE 1.—*The topography is generally rugged.*

serve them. The textile industry, which in itself is independent of the mines, draws two-thirds of its personnel from the female population, largely wives and daughters of miners. Local agriculture depends for its income on the inhabitants of the mining towns. Construction, trade, and service occupations are almost entirely dependent for their incomes on the local population; so they too are indirectly dependent on the mines.

The importance of coal to the regional economy is made clear by the fact that coal provided 41 percent of the basic income of the region in 1940. The sources of this basic income are twofold: production based on local raw material, and manufacture of finished products from imported raw materials. The amount of income attributable to each of these sources is as follows: [1]

Value of products from local raw materials:	
Anthracite	$192, 539, 500
Other mining	8, 363, 400
Agriculture	46, 233, 370
Forest products	9, 019, 500
Total	256, 155, 770
Value added by manufacture to imported raw materials:	
Metals	66, 721, 300
Textiles	54, 944, 900
Food [1]	48, 448, 800
Forest products	7, 684, 400
Other manufactures	35, 397, 900
Total	213, 179, 300

[1] Includes value added by manufacture to food grown in area.

Population and Employment

The existence of coal in this area has long been known. The deed by which the Six Nations con-

---

[1] COMMONWEALTH OF PENNSYLVANIA, DEPARTMENT OF INTERNAL AFFAIRS. TENTH INDUSTRIAL CENSUS OF THE COMMONWEALTH OF PENNSYLVANIA. Harrisburg. 1941.

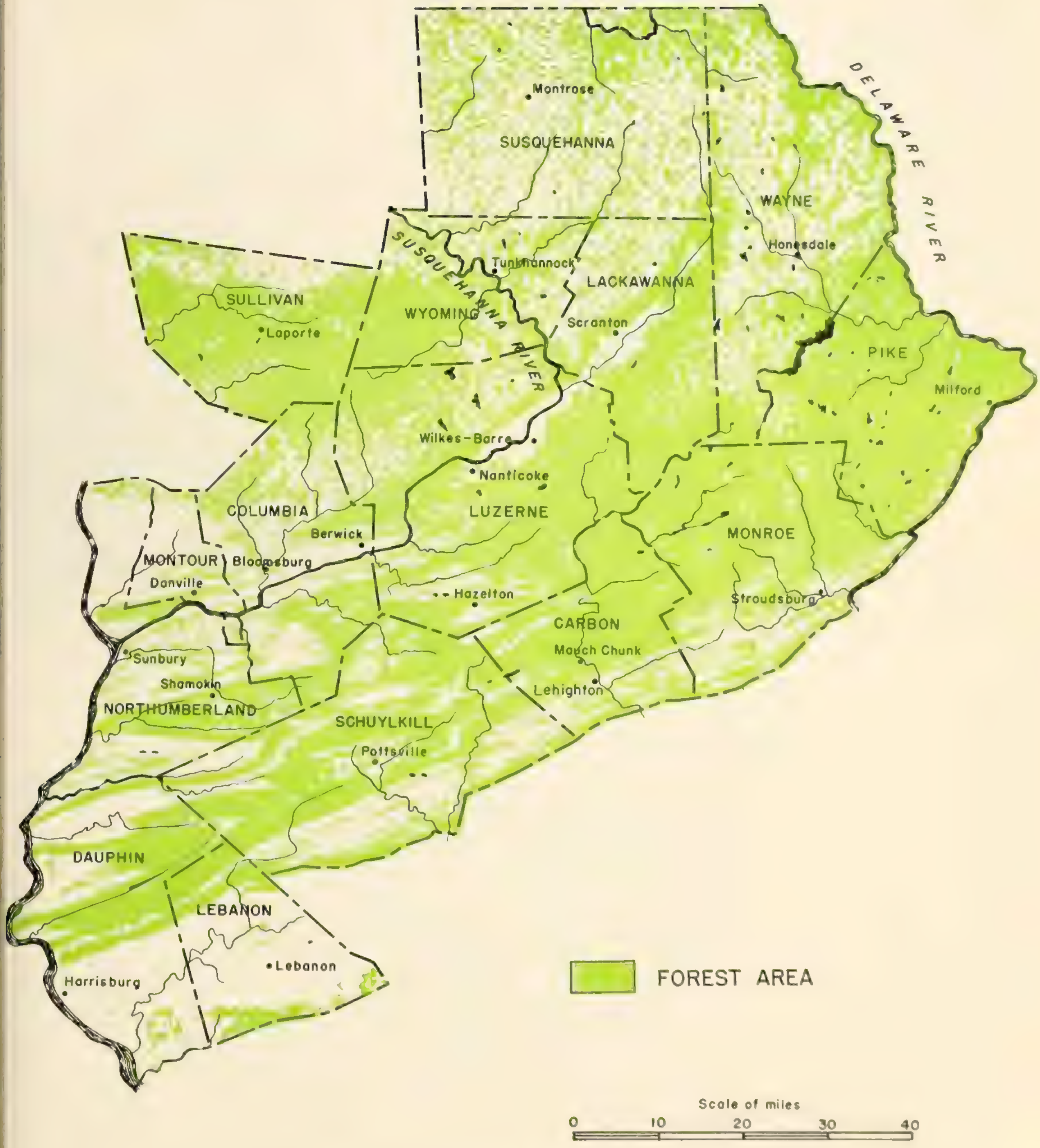
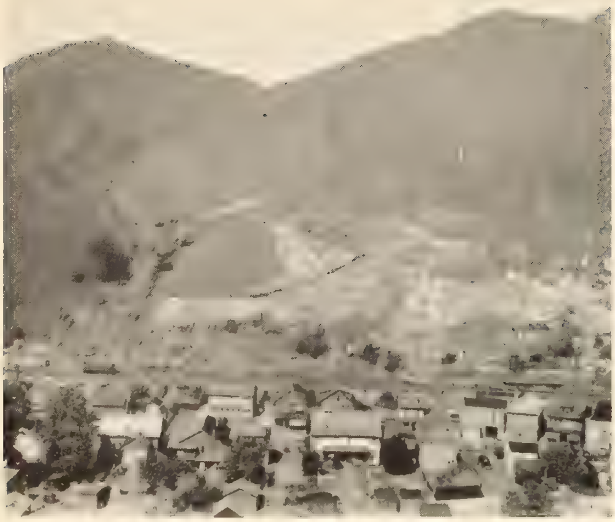


FIGURE 2.—*The forests of the Anthracite Forest Region.*



F–44748C

Figure 3.—*The region's economy is based on coal mining.*

veyed the territory to the Susquehanna Company in 1754 specifically mentions "the mines, minerals or ore of what kind soever"; and at a meeting in 1763 the company voted to reserve for company use and disposal "all beds of mine ore and coal." [2] The development of this resource was started in the 1790's, but it was not until after the War of 1812, and especially after the building of the Lehigh River canal in 1827–29, that coal production began on a commercial scale. From then on the mining of anthracite increased steadily until 1917. In that year the output totaled 100 million tons, and 154,000 persons were employed in its production.[3]

Meanwhile the population had increased rapidly and had become extremely complex. The original settlers of the region were mostly farmers of English and German descent. During the nineteenth century this basic population was gradually augmented by an industrial population that came in part from other sections of the country, and in part from Europe, especially from Wales. From 1890 to 1920, while the rural population declined slightly the population in the urban areas increased rapidly, largely because of the immigration from eastern Europe of thousands drawn here by the employment opportunities offered by the mines. By 1920 the population exceeded 1,475,000 persons.

In the 1920's the economic vitality of the region began to wane. The mining industry, afflicted with a combination of increasing production costs and decreasing markets, began to reduce its output. Other industries were unable to take up the slack. Migration into the region ceased; but the birth rate was considerably higher than the death rate, and the population continued to grow. Labor disputes, which had occurred with increasing frequency throughout the period of growth, now became almost chronic. Unemployment became widespread.

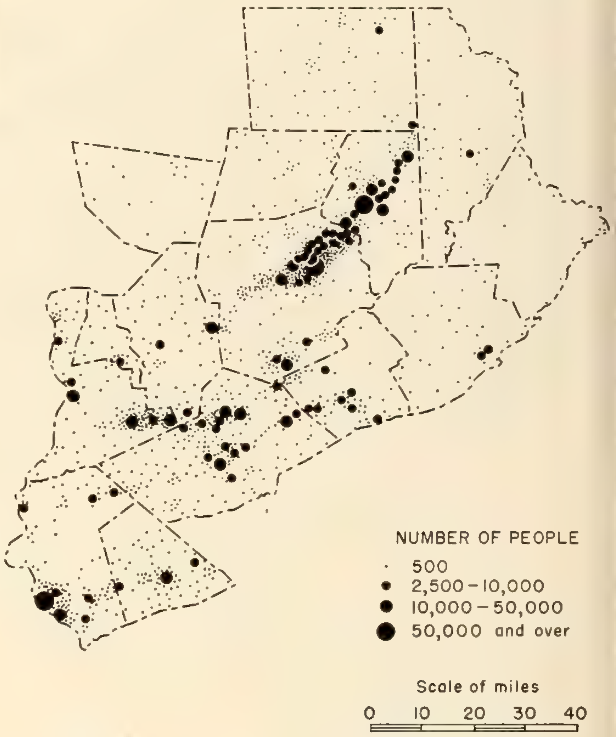


Figure 4.—*Population is concentrated in the coal fields.*

During the depression of the 1930's the situation in the region was acute. Coal production fell to a low of 46 million tons in 1938, and employment dropped to 97,000.[4] Between 1930 and 1940, 93,000 persons moved out of the region in the hope of finding work elsewhere.[5] Even so, the population continued to

---

[2] Wyoming Historical and Geographical Society. susquehanna county papers. Wilkes-Barre, Pa. 1930–33.

[3] Federal Anthracite Commission. economic conditions in the anthracite coal region. 18 pp. Washington, D. C. 1942. (H. Doc. 709, 77th Cong., 2d sess.)

[4] Commonwealth of Pennsylvania, Department of Mines. anthracite division annual report. Harrisburg. 1938.

[5] Rettie, James C. the population and employment outlook for the anthracite region of pennsylvania. Northeast. Forest Expt. Sta. Anthracite Survey Paper 6. 25 pp., illus. Philadelphia. 1945. [Processed.]

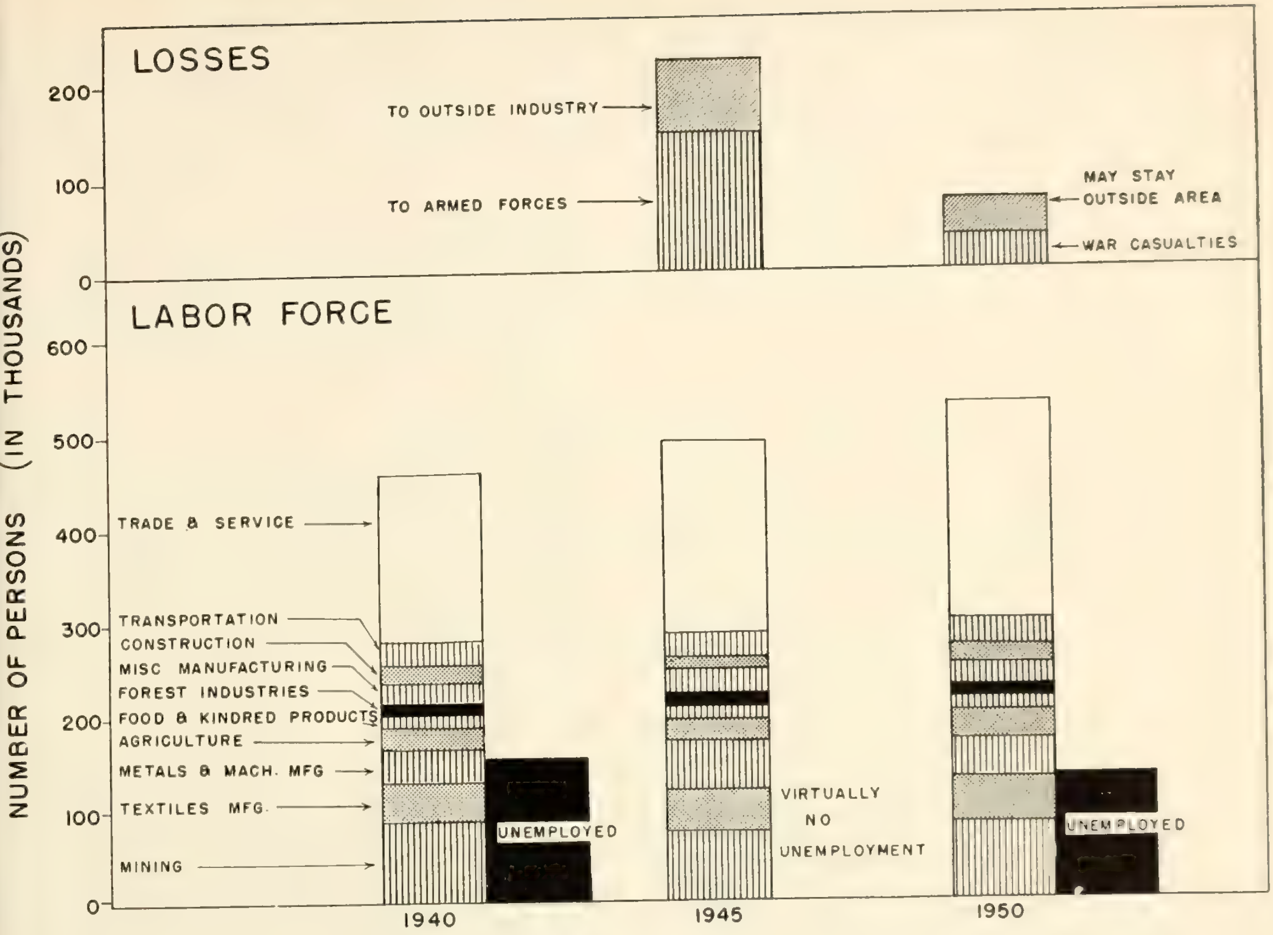


FIGURE 5.—*Employment in 1940 and 1945, and outlook for 1950.*

increase, reaching in 1940 a maximum of about 1,602,000, much of it concentrated in the neighborhood of the coal fields (fig. 4). In that year 463,000 people were employed; 169,000 persons, 27 percent of the total labor force, were seeking employment (fig. 5). The commodity-producing industries accounted for 49 percent of the employment; the remainder was provided by the dependent construction, transportation, trade, and service occupations.

In the years 1940–45 the war effected radical changes. About 145,000 men and women from the region entered the armed forces; 70,000 went elsewhere to work in war industries. Production increased and brought a consequent increase in employment. The 77,000 young people [6] who reached working age during this 5-year period were thus able to find work, and a labor force of 493,000 was virtually all employed when the war ended.

But what are the prospects for the future?[7] Many of the thousands who were in the armed forces or worked in war plants outside the region will have returned home. Thousands of young people will have grown up and will be looking for jobs. By 1950 there may be 639,000 persons in the labor force — 146,000 more than in 1945. Will there be jobs for everybody?

The anthracite industry may be able to support a few thousand more than at present. Though coal production amounted to 60 million tons in 1944, the increase was due almost entirely to strip mining and mine waste-bank reclamation, which require relatively little manpower. Longer wartime hours and more efficient methods made it possible for fewer men to mine more coal. The number employed by the industry in 1944 was less than 78,000. Furthermore, the coal deposits, especially in the neighborhood of Hazleton, are nearing exhaustion. Production tend to remain high or to go higher. It may be possible to bring about an increase in markets, but competition of other fuels threatens to be strong. The trend toward shorter hours and the development of the coal deposits in the southern part of the region may effect a small increase in employment.

---

[6] This figure represents the net addition to the working force after allowance has been made for deaths and retirements.

[7] See footnote 3, p. 4

Prospects for most of the other industries are not much better. In 1945 the metal industry employed nearly double the number it employed in 1940. If it can convert itself sufficiently to the production of peacetime commodities, this industry should be able to maintain its high employment level. The textile industry, with employment slightly greater than that of 1940, presumably is finding adjustment to postwar conditions easier than the metal industry. Agriculture, which declined somewhat, will probably return to its prewar status. But the existing industries of the region can hardly absorb more than a comparatively few thousands above the numbers employed in 1945. By 1950, with the previously mentioned increase in the labor force, there may be as many as 112,000 persons lacking regular employment.

MISUSE OF THE FORESTS

In the eighteenth century, when settlement of the Anthracite Forest Region began, the forests were its outstanding feature. In the north were dense stands of sugar maple, beech, birch, black cherry, white ash, chestnut, white pine, and hemlock. The central and southern counties were covered with red, white, and black oaks, in many places mixed with chestnut, white pine, and pitch pine; in the ravines were stands of white pine and hemlock; and the ridges were covered with chestnut oak. In what is now western Monroe County and in Carbon County there were sizable areas of scrub oak; but the rest of the region had an almost continuous cover of exceptionally fine timber.

Early Exploitation

The farmers who first settled the region cut the timber to clear land for crops and pasture. During the nineteenth century the felling of hemlocks for tanning bark and of pines for construction lumber greatly reduced the volume of softwood timber; by the 1880's the sawlog-size white and pitch pines of the northeastern counties were almost entirely gone. Toward the end of the century sawmill operators began felling the mixed hardwoods of the northern counties. Meanwhile the growing anthracite industry was making inroads on the oak stands near the mines.

In general the forests were clear-cut and often the cutting was followed by fire in the logging slash. Not infrequently, because of the quantity and condition of the slash, the fires were of great intensity; even the humus was destroyed, and reproduction was prevented. The maple-beech-birch forests were too often replaced by stands of aspen, gray birch, and pin cherry; and the oak stands by scrub oak.

By the first decade of the present century the forests were greatly reduced. Only a few virgin stands remained, in inaccessible areas and recreational preserves. In the neighborhood of the mines second-growth oak stands were being clear-cut for mine timbers. Fires were becoming more frequent and more destructive, especially near the mines and in Pike and Monroe Counties. Except for an increase in scrub oak and aspen, however, the type distribution of the original forests remained unchanged.

In the northern counties some cleared land has proved unfit for crops and even for grazing, and is now being allowed to revert to forest. A considerable number of farms in this area have been abandoned altogether (fig. 6). Some of these are reverting to forest so slowly that they need planting; and even

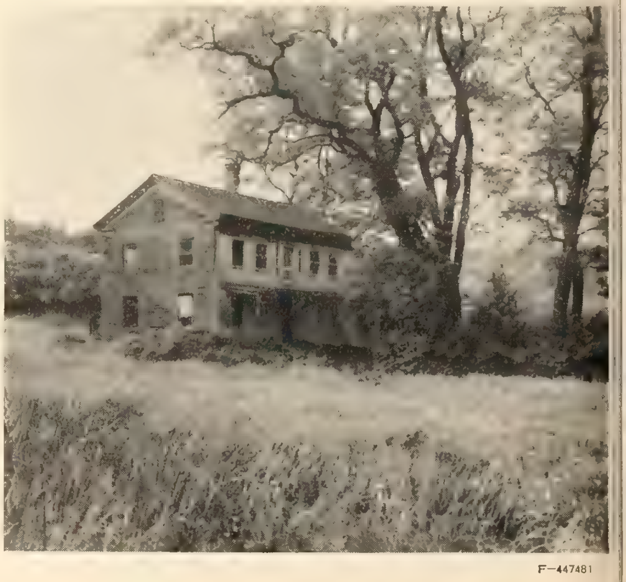

F—447481

FIGURE 6.—*Some farms have been abandoned.*

where the natural reversion is rapid, the resulting stands are often of poor quality. This kind of land, together with the waste areas around towns, accounts for 100,000 acres in need of planting.

Effects of Mining Operations

The forests in the coal fields have been severely abused. The coal companies acquired the land not for the timber on it but for the coal beneath it. So long as they could harvest mine timbers they did so, but once the timber was cut, the coal companies' interest in the forest was usually gone. They set up breakers and piled mine waste wherever it was convenient. In the 1920's they began a regular practice of stripping off the soil to reach coal near the surface, and in this way destroyed thousands of acres of forest land. Meanwhile fire after fire ran through much of what was left of the forests, leaving little but scrub oak and thinly stocked stands of commercial species.

Clear-cutting Practices

Even now clear-cutting of immature stands is widely practiced. Furthermore, wartime restrictions on transportation resulted in the cutting of progressively younger stands. The requirements of the mining industry are such that loggers have had a sale for everything on a tract of woodland. The larger trees produce sawlogs or gangway timbers; timber of pole size produces mine props; and smaller growth down to about 3 inches is used for lagging.[8] Anything left, together with any sprout growth, is easily destroyed by fire. It is estimated that even under present conditions some 35,000 acreas of woodland, much of it immature timber, is clear-cut annually.

Unused Areas Near Towns

Waste areas near towns are increasing. The population is declining and many tracts that have been

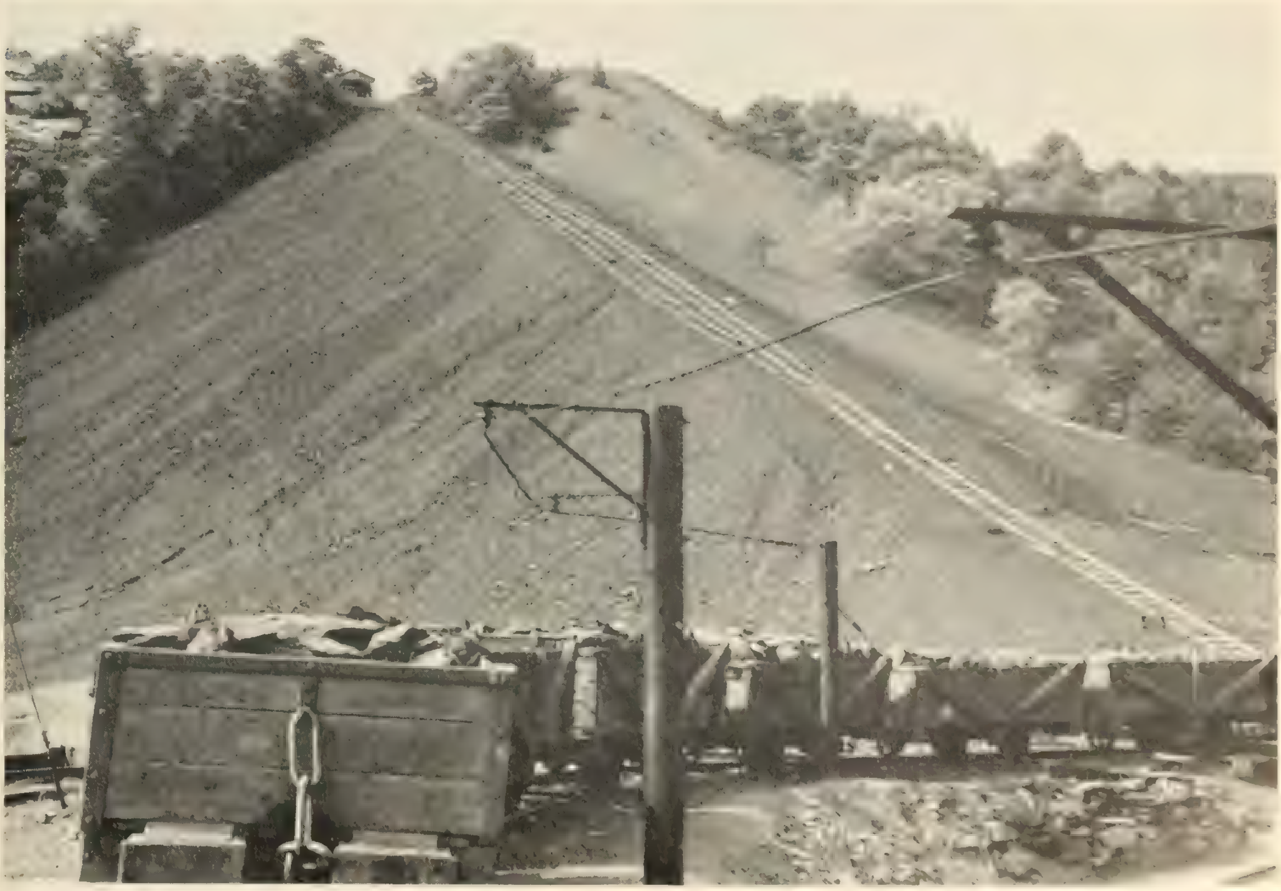


FIGURE 7.—*Unproductive mine waste banks cover thousands of acres.*

---

[8] Sticks up to 4 inches in diameter and up to 6 feet long, placed close together between the props and the mine walls and roof to prevent loose material from falling into passages.

held for housing developments or were used for one-family farming operations have grown up to grass and have become catch-alls for rubbish. These unsightly areas constitute a serious fire menace. If planted, they would provide recreational areas for the townspeople, and eventually timber.

Mine Waste Banks

Mine waste banks (fig. 7) cover thousands of acres that might otherwise be forested. In dry weather they are a source of blowing dust; tons of silt erode from them into the valley bottoms, and they contribute largely to the silting of streams. United States Army engineers estimate that each year nearly a million tons of mine waste enters the Schuylkill River alone, and that 30 percent of this is from the surface waste banks.

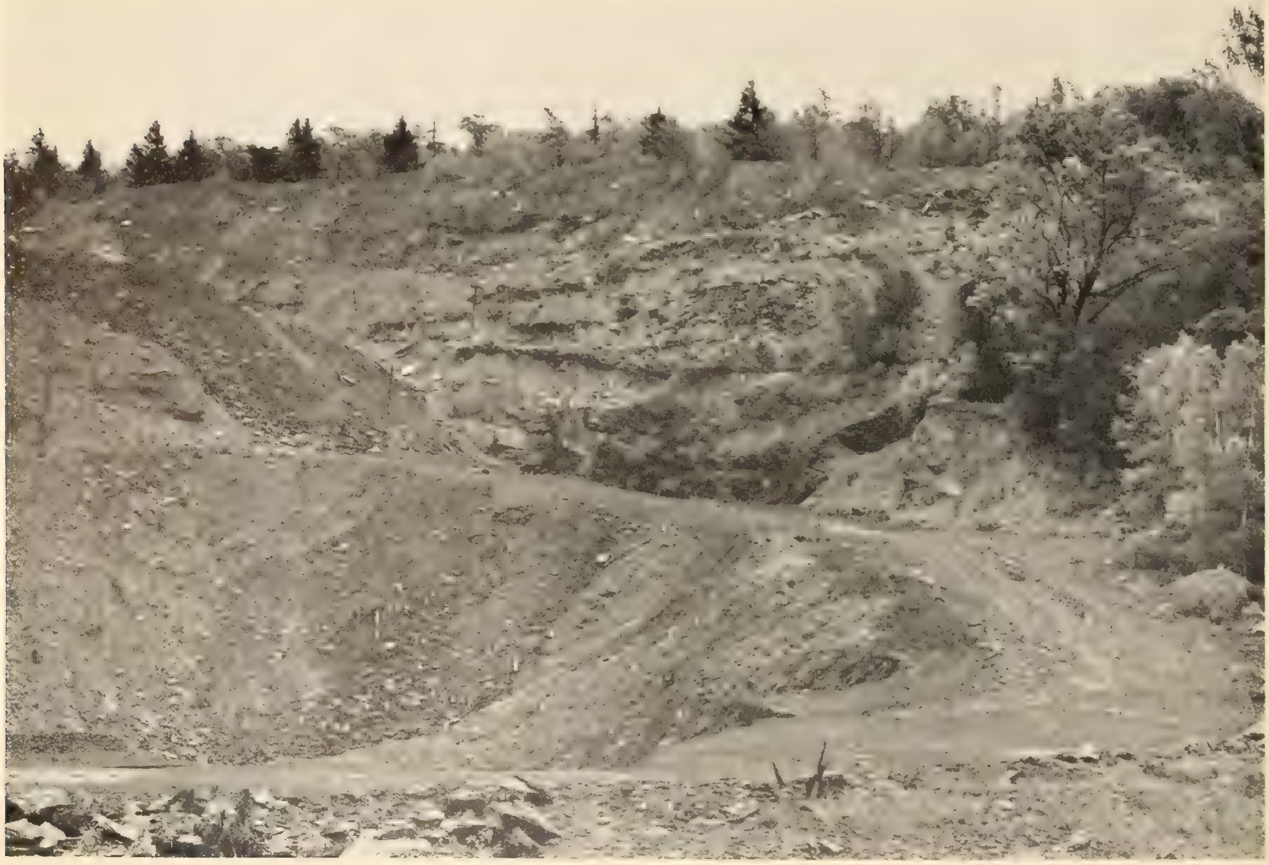
Analysis of the banks has shown that they lack essential minerals, have little or no humus, are highly acid, and easily become overheated near the surface.[9] These factors make it difficult for trees to become established. Fertilizers and shading might assist young transplants in overcoming these obstacles. Experiments in planting in the northern field show that black locust will grow on mine waste. Clammy locust also will accommodate itself, and a few other species have shown promise. Some natural afforestation takes place.

Surface Strippings

The last 20 years has seen a great increase in surface stripping. With the development of modern machinery, it has proved cheaper to mine coal that lies near the surface by this method. As a result thousands of acres of forest land have been stripped of their soil and the forests destroyed. The banks of shale, soil, and sandstone thrown up in the process of digging

---

[9] Ostrom, C. E. REPORT ON PRELIMINARY SURVEY OF PLANTING PROBLEM ON ANTHRACITE MINE REFUSE BANKS. 34 pp. 1940. [Unpublished ms., Allegheny Forest Expt. Sta.]



F-447483

Figure 8.—*Surface strippings present a difficult problem.*

are slightly more fertile than mine waste banks, and some could be successfully planted. But the deep ditches (fig. 8) are difficult planting sites. These strippings, together with the mine waste banks, now cover some 100,000 acres.

Fires

Fire has been the chief enemy of the Anthracite Forest Region for years, especially in the coal-field forests. Large unbroken areas of young growth give fire a free sweep. The land surface is abnormally dry, partly as a result of underground drainage into the mines. Furthermore, clear-cut areas on which slash has been left where it fell are particularly susceptible to fire. The fire hazard is everywhere. Add to that a dense population and fire becomes almost inevitable.

Fires in the coal-field forests have serious consequences. They may ignite the coal deposits or get into mine waste banks and burn for decades. They may destroy mine ventilator shafts, and smoke from fires may seep into the mines. Destruction of humus, brush, and other ground cover by fire allows rainfall to run off rapidly. Such runoff finds its way readily through crevices into the mines, aggravating an already mounting problem of mine-water control.

In the 30-year period 1913–42 there were nearly 28,000 forest fires in the 6 principal coal-producing counties (Carbon, Columbia, Lackawanna, Luzerne, Northumberland, and Schuylkill), and an average of about 37,900 acres was burned each year in those counties alone. (These figures include some acreage that lies outside the coal fields, but the majority of the fires originated within that area.) Fires occur repeatedly in the same places, but even so, the acreage that has been burned over at least once during the past 30 years is staggering.

The seriousness of forest fires in the coal-field area is emphasized by comparison with the fire situation in the rest of the Anthracite Forest Region and in the State as a whole. During the same 30-year period the six coal-producing counties (although they contain but 44 percent of the forest land of the region and only 9 percent of the forest land of the State) reported 81 percent of the forest fires in the region and 34 percent of the forest fires in the State. In terms of acres, 75 percent of the area burned annually in the Anthracite Forest Region and 23 percent of the area burned in the State lies within these six counties.

Floods and Landslides

Floods have occurred in the region as long as the white man has known it. There is record of a flood in the Lehigh Valley as early as 1786. The destructiveness and frequency of these floods have been increasing. A flood in the Lehigh Valley in 1942 caused damage estimated at more than $5,500,000. A serious flood in the Susquehanna Valley in 1936 poured 10 billion gallons of water into a mine near Pittston; the same flood overflowed downtown Wilkes-Barre.

Research has shown that the rapidity of water runoff and the danger of floods is greatly increased by the destruction of humus in headwater areas. It is reasonably certain that the floods in the Anthracite Region are due in part to this cause. Clear-cutting and fires have destroyed the humus in many

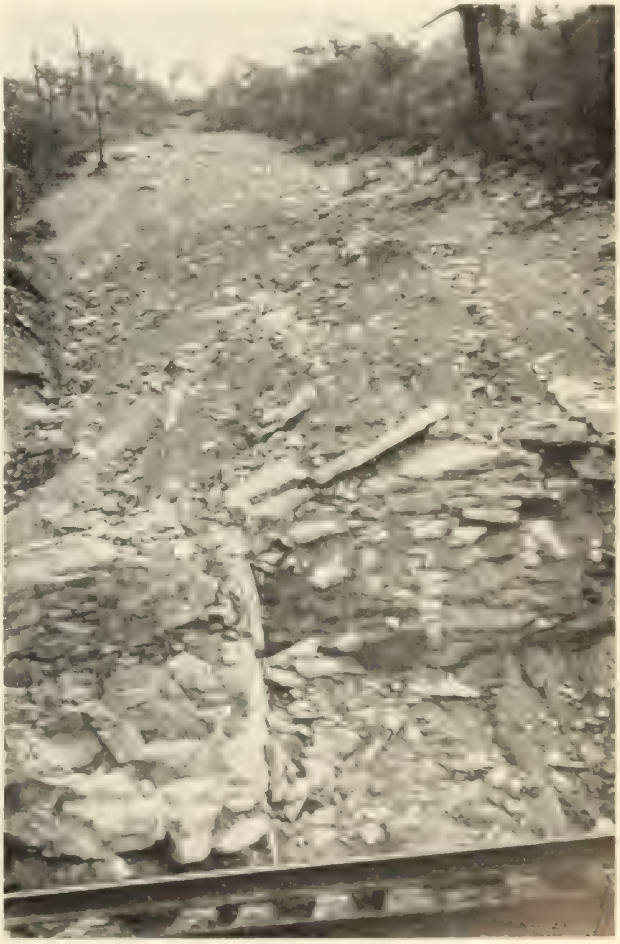


FIGURE 9.—*Landslides are a constant th* [illegible]

upstream areas. The restoration of this humus by the establishment of adequate forest cover would do much to lessen flood damages.

Susquehanna River floods must be traced to causes outside the region and dealt with where those causes lie. Floods in the Lehigh River, however, in the Lackawaxen, and in Solomon's Creek are due to local conditions and must be met with local action.

One problem demanding special attention is the occurrence of landslides in the Lehigh Gorge between Mauch Chunk and White Haven. Here steep slopes with loosely embedded boulders and sparse vegetation overhang railroads along both sides of the river, and periodically precipitate tons of earth onto the railroad beds. Several such landslides (fig. 9) took place in conjunction with the 1942 flood and, together with wash-outs, resulted in damage estimated at more than a million dollars. Minor slides occur from time to time, especially below Rockport on the slopes of Bald Mountain and Summer Mountain, and the threat of other destructive slides is constant.

Typical of these slides was one on Bald Mountain about a quarter of a mile west of the Rockport station of the Central Railroad of New Jersey. The mountaintop has been badly burned and the runoff is rapid. Near the top of the slope depressions permitted accumulated surface water to enter the ground and form an underground stream. The slide occurred when this underground stream broke loose and dislodged the entire land mass.

ATTEMPTS AT IMPROVEMENT

The people of the Anthracite Forest Region are not unaware of the problems arising from past misuse of the forests. Several agencies and individuals have made a good start toward improving the situation. But in spite of all that has been done, the situation is still serious. In all of the forest problems—fire control, reforestation, timber management, flood control, watershed protection, and development of recreation facilities—much remains to be done.

The public agency that has made the greatest contribution to the solution of these problems is the Pennsylvania Department of Forests and Waters. This agency is responsible for fire prevention and control in the State. It is also charged with responsibility for reforestation; and its nurseries provide seedlings at nominal cost to anyone who wishes to plant them for timber production or watershed protection. In the 128,000 acres of State forests which it administers in the Anthracite Forest Region the department is carrying out programs of timber improvement and recreational development. It also cooperates with other public and private organizations such as the United States Forest Service, the Extension Service, and civic groups interested in forestry.

Numerous private agencies have also contributed to the gradual improvement in forest conditions in the region. As early as 1902 the Pocono Forestry Association of Monroe County was organized as a "fire protective association"; this organization now concerns itself largely with reforestation and forestry education. Other local fire-fighting organizations have come and gone. In 1917 the Anthracite Forest Protective Association was formed with headquarters at Hazleton, and concerned itself for a number of years with educational programs as well as fire control. A forest-fire-fighting organization was established and flourished for a short time in the borough of Mount Carmel.

Outstanding among the private agencies now stimulating good forest management is the Wyoming Valley Chamber of Commerce in Wilkes-Barre. Although fire prevention and control is the major purpose of this organization, it has a broad program of forest improvement. In 1939 it set up an industrial forestry committee, and a year later it organized an industrial forestry division.

The chamber of commerce has also concerned itself with the establishment and management of community and county forests. In 1942, at the request of the Luzerne County commissioners, the chamber of commerce made an appraisal of 6,397 acres of tax-delinquent forest lands. It recommended that about 2,900 acres be retained by the county as a county forest to demonstrate good fire protection, woodland management, watershed protection, and recreational uses. The county commissioners approved the plan and authorized the industrial forester of the chamber of commerce to serve as county forester.

The chamber of commerce has given strong backing to farm forestry and it works in close collaboration with the farm forester of the area. It has also given valuable assistance to absentee owners, banks, mine-timber operators, and others, especially in inventorying and evaluating forest properties and in marketing woodland products. It has supported reforestation projects, studied watershed problems, recommended nature-study programs, and has generally kept in touch with all plans for forest improvement in Luzerne County and the surrounding region.

Fire Control

Intense fire prevention and control is one of the first needs of the region. The seriousness of the fire situation has caused considerable local concern, and various efforts have been made in the past 40 years to alleviate it. As a result the situation has improved, especially in the last two decades. Although the number of fires has increased, the average annual burn has been reduced, as the following tabulation shows:

	Fires per year (*Number*)	*Average annual burn* (*Acres*)
1921–25	1,249	112,492
1936–40	1,652	24,858

Since many of these fires occurred in areas that had been burned over at least once before, the actual forest damage has not been so high as might be expected. In 1936–40, for example, the average annual forest damage was estimated at $47,470. On the other hand, these repeated fires hinder reproduction and seriously retard the regrowth of the forests.

The reduction in area burned per fire speaks strongly for the effectiveness of the fire-control measures that have been in operation. Much of the improvement can be credited to the organization set up by the Pennsylvania Department of Forests and Waters. A State-wide system of fire prevention and control was established in 1915; in 1920 it was expanded into a district organization. (The Anthracite Forest Region includes all or parts of five of the State districts.) In 1923 the State began to erect fire lookout towers at strategic points (fig. 10) and to acquire up-to-date fire-fighting equipment. In 1934 the installation of a radio-communication system for forest fire control was begun. Although much progress has been made in protecting the forests from fires, the number of fires annually and the acreage burned are still far too large.

In the Luzerne County area, the Wyoming Valley Chamber of Commerce has been especially active in fire prevention and control. In cooperation with the Department of Forests and Waters it instituted a prevention and control program in the Wilkes-Barre division. Through investigation of the causes, frequency, and destructiveness of forest fires a detailed plan for intercommunity cooperation was developed in Luzerne County. Coal, water-supply, railroad, and telephone companies were enlisted to assume responsibility for fires occurring on or near their properties. Railroads have given increasing cooperation in burning safety strips along their rights-of-way. Township fire departments have been made responsible for grass fires, which often spread into the forests. Paid fire fighters are called out only as a last resort. This set-up was augmented in July 1942 by the Forest Fire Fighters Service, a volunteer organization established by the Office of Civilian Defense.

Reforestation

The attempt to control and prevent fires has been paralleled by the planting of open areas with tree seedlings. During the decade 1934–43 the number of seedlings planted averaged 1¼ million a year, a total of 12,603,000 for the decade. Well over a third of these were set out in Schuylkill, Columbia, and Luzerne Counties. Some hardwood seedlings have been planted, but conifers have been preferred. Red pine, Norway spruce, white pine, and pitch pine account for two-thirds of the number set out.

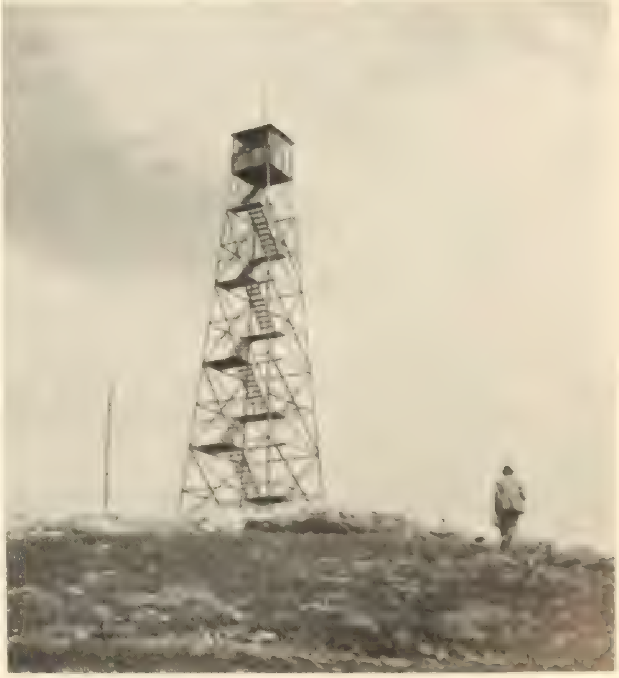


FIGURE 10. *Fire lookout towers have been* [illegible]

F-447486

FIGURE 11.—*Plantations have been established around reservoirs.*

The type of area planted has varied. Plantations have been established around reservoirs (fig. 11). Seedlings have been spot-planted in poor timber stands to improve the species composition of the stands. Plantings have been made on unused areas near towns, mine waste banks, and abandoned or otherwise unused farm lands. In all, about 30,000 acres have been planted.

Timber Management

Altogether, about one-eighth of the forest area is under some degree of management for timber production, but there is very little intensive management. The total area under intensive management amounted to only about 5,000 acres in 1945.

Timber-stand-improvement measures, introduced during the last few decades, have been fostered by State agencies. Many farmers and some private owners practice good timber management, and a small start in this direction has been made by a few coal companies and mine-timber operators. On the whole, however, timber management has hardly begun.

State Agencies

Management for timber production has been carried on extensively in the State forests. A complete forest inventory was made between 1934 and 1936. Defective, mature, and overmature trees have been removed through sales to private operators under State cutting regulations, and considerable improvement cutting has been done. Planting also has been carried on, much of it spot-planting for the purpose of stand improvement. In the Delaware State Forest alone 1,146,000 seedlings were set out between 1899 and 1939. In the Wyoming State Forest, much of which had been clear-cut before the State acquired it, the emphasis is on watershed improvement. During the war, logging on State lands increased, usually under diameter-limit cutting practices.

The Pennsylvania Game Commission, which owns 232,000 acres of forest, also has given some attention to timber-stand improvement and to management for timber production (although it is primarly interested in game production). Some open areas have been planted. Some stands have been weeded to leave species favorable to game. Considerable cutting has been done recently on a diameter-limit scale.

The Extension Service

The extension service of the Pennsylvania State College has been responsible for part of the improvement in farm woodlands. The extension forester answers requests for information; and if there is sufficient interest in any given locality, he arranges meetings through county agents and gives demonstrations of forestry practices. His primary object is to teach farmers how to care for their own woodlands.

Cooperative Farm Forestry

Two full-time farm foresters were working in the Anthracite Forest Region in 1947. Both worked out of Wilkes-Barre in Luzerne, Lackawanna, and Wyoming Counties. This work was financed cooperatively by the State and Federal Governments under the Norris-Doxey Cooperative Farm Forestry Act of 1937, with assistance from the Wyoming Valley Chamber of Commerce. It was under the direction of the Department of Forests and Waters, with technical supervision from the United States Forest Service. The work has been limited to helping farmers manage their woodlands and market their products. The farm forester inventories a farmer's woodlands, estimates the annual growth and the allowable cut, marks the timber for cutting, and provides the farmer with information on the available markets.

Forestry by Farmers

Under the guidance of the extension service, and in some localities aided by a cooperative farm-forestry program, a number of farmers have long managed their woodlands with considerable skill. Among the farmers of the region, cutting practices (fig. 12) are generally better than the average for all private owners.

The management of farm forests varies with the needs of the farmer. In most instances the best trees are cut and custom-sawed for use in repairing and replacing farm buildings. Trees of poor form or otherwise of less value as saw timber are cut for fuel, fence posts, and mine timbers. In many parts of the area it is a common practice to exchange mine timbers for coal on a ton-for-ton basis. Since few farmers own more than the 10 to 25 acres required to provide the fuel and lumber they need on the farm, commercial sales of timber from farm woodlands are seldom feasible.

To some extent these farm forests are thought of as bank accounts, assets set aside against a rainy day, which are meanwhile increasing in value as a savings account accumulates interest. In times of depression the low-income farmers have to fall back on these forests, and at such times many small farm forests fall to the ax. Unfortunately, the timber is often sold on a lump-sum basis without adequate knowledge of its market value. Not only does the farmer in such cases fail to realize the full worth of his product, but the product itself often is not used to the greatest advantage. Saw-timber material of high quality, for example, not infrequently goes into the mines as mine timbers. However, there are in the area a few examples of cutting where the owner has used excellent judgment in selecting the trees to be removed.

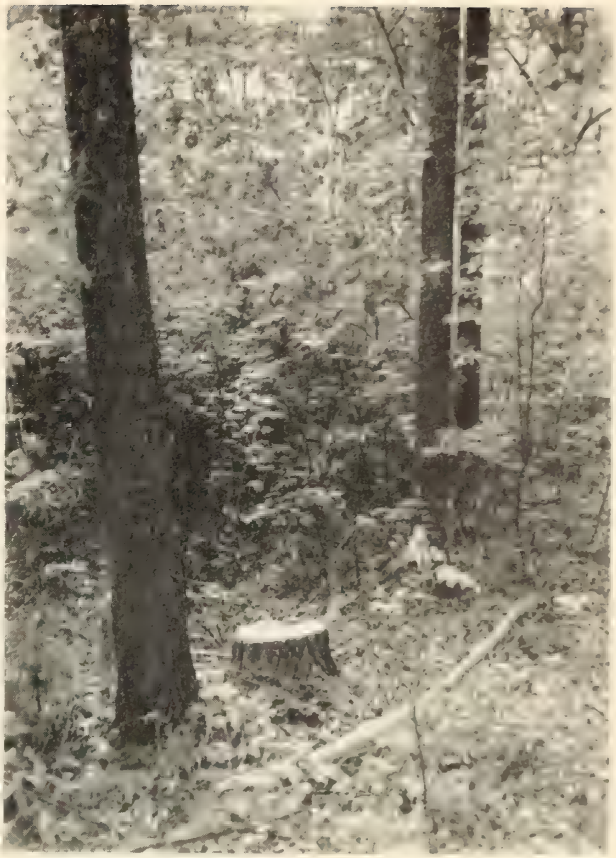


FIGURE 12.—*An example of selective cutting in a farm woodland.*

Cutting by farmers was considerably stimulated by the war. The farm agent in Susquehanna County reports that cutting about doubled as a result of wartime demands. The Susquehanna County cutting was heavy but it was at least in some degree selective. Overmature timber was removed, but apparently a good deal of young growth also was cut. The county agent of Wyoming County reports a considerable increase in mine-prop production in the smaller woodlands. Here, and presumably elsewhere, mine-timber operations have followed the established custom of clear-cutting.

Coal-company Forestry

Concern for the condition of their forests has been more or less thrust upon the coal companies, for the devastation of the forests has injured their primary business of mining. Intermittently this concern has led to specific steps to protect the forest from fires or to plant devastated areas, though such effort has generally been short-lived.

One coal company, however, has employed a full-time forester and has had an active program in operation since 1913 (fig. 13). The primary objective has been the prevention and control of forest fires. A year-round crew of about 20 men is maintained and modern equipment is used. During nonhazardous seasons this crew is kept occupied with the cutting of safety strips and other fire-prevention operations.

F-394 55

FIGURE 13.—*One coal company has had an active forestry program since 1913.*

Recently this company purchased 20,000 acres of watershed adjacent to its coal-field holdings, some of it run-down farm land, to guarantee a supply of fresh water for washing coal. On a part of this land the company has planted 125,000 seedlings—white and red pines, larch, and Norway spruce—for watershed protection. It has also experimented with mine waste-bank planting. Besides its holdings in the coal-field area, this company owns about 43,000 acres in the western Poconos. This forest land has been managed for water supplies, mine timbers, and game, and more recently for saw timber.

For a number of years during the 1930's another company employed a full-time forester who concerned himself with fire prevention, reforestation, brush removal, and water-supply control, a program that resulted in greatly increased respect for the company's lands among employees and local residents. Several other coal companies have at various times been active in promoting fire prevention and fire control. A number of companies cooperate with the State organization by maintaining at collieries standby crews that may be called out in case of fire on company lands.

Other Private Owners

Most of the smaller privately owned tracts of forest get no conscious management and are left to grow as they will. Occasionally an owner sells timber rights to a commercial operator for a lump sum; whereupon the operator clear-cuts the property. Some owners use their land for hunting and camping. Many properties are not used at all.

However, one large forest-land owner, whose holdings total about 60,000 acres, has had the services of a private forester for more than 20 years. Water-supply companies, some of which own much land and all of which are primarily interested in protecting their water supplies, have generally restricted cutting; and about 50,000 acres are thus under some degree of management.

Most of the mine-timber operators work by a clear-cutting system. Rarely are they able to return to the same area for another cut until 40 or 60 years later. An exception to this is one of the largest companies, which operates several sawmills and a planing mill, besides producing mine timbers. About 25 years ago this company realized that a slight adjustment in cutting practices would permit more frequent cuts from their timber land; so they instituted a diameter-limit cutting system, removing only trees of 6-inch stump diameter or larger. Since then they have been buying up timber land until they now own approximately 12,000 acres, some of which they are managing for the production of high-grade lumber. In 1942 the company experimented with even lighter cuts and determined that diameter-limit cuttings of about 10 inches at the stump were most economical. They are now able to return for subsequent cuts at about 10-year intervals.

Flood Control

Several organizations have been formed to deal with flood-control problems. Those of the Lehigh watershed are being studied by the very active Lehigh Valley Flood Control Council, with headquarters in

Bethlehem. Floods in the Lackawaxen watershed have brought about the formation of a flood-control council in Honesdale. In addition to these organizations, the Interstate Commission on the Delaware River Basin ("Incodel"), a public commission supported jointly by New York, New Jersey, Pennsylvania, and Delaware, has for a number of years concerned itself with problems affecting the Delaware River watershed as a whole. It is now turning its attention specifically to the relation of soil and forest conservation to flood control. Good though the work is which these agencies are doing, it needs to be supplemented by that of other organizations.

Recreation

One of the principal uses of the extensive forest areas has been for recreation. Attractive lakes and streams are found throughout the region; and these, together with the cool, high altitudes, draw thousands of vacationists from the cities each year.

Part of the recreational development has been of the "exclusive" type. Private clubs have been set up with golf courses, swimming pools, dining rooms, and other facilities that only members and guests can use. Nine large tracts in Pike County belong to sportsmen's clubs. Other private estates vary in size from manorial residences to rough cabins on rented land.

Many privately owned recreation developments are available to the general public. In Monroe County 29 percent of the forest area is held by resort owners, 7 percent belonging to seven of them. In the North Mountain area also, privately owned recreational spots have been developed, the best known being along Lake Eaglesmere in Sullivan County.

Recreation has been an important item in the management of the State forests. Recreational parks with drinking water, parking space, well-marked trails, and other facilities for visitors are maintained. At the Promised Land State Park in the Delaware State Forest and at the World's End State Park in the Wyoming State Forest are tourists' cabins and swimming and boating facilities. Recreational developments are underway in the State park at Kitchen Creek (fig. 14). Permanent camp sites within State forests are leased to individuals for periods not exceeding 10 years with renewal privileges.

The State forests, with the exception of the recreational areas and game refuges, are available for both hunting and fishing. Large quantities of game are

F-447459

Figure 14.—*Scenic areas abound in the State parks.*

Figure 15.—*Forests adjacent to lakes are popular [illegible] sites.*

taken annually. Fishing facilities are exceptionally good. A fish hatchery is operated by the State in Wayne County, and many streams, both in the State forests and elsewhere, are stocked from this hatchery.

The primary purpose of the game-commission forests is to serve as game refuges and hunting grounds. These forests are kept stocked with small game, and much large game is also to be found. Each tract of game-commission land comprises a game refuge surrounded with a hunting ground, a system of game protection that has been found singularly successful.

Some owners of private recreational areas also carry on forest management. Several large tracts are managed on a partial-cutting basis. In general the forests adjacent to lakes and streams are reserved from cutting (fig. 15), but the timber on more remote areas is in many cases sold to sawmill or mine-timber operators and is clear-cut. There is still a great opportunity for improving the beauty and value of the timber stands in recreational areas.

FOREST INDUSTRIES

With a background of forest exploitation and small though encouraging efforts to restore productive forests, the forest-products industries cannot be expected to contribute very heavily at present to the region's economy. They accounted for only 4 percent of the region's basic income in 1940 and for a little less than 2 percent of all employment in 1945.

Value of Products

The income derived from harvesting, transporting, and manufacturing forest products totaled nearly $17,000,000 in 1943. About 40 percent of this was the value added through manufacture of products from imported raw materials. The remainder came from the production of primary products of local forests:

Mine lumber	$2, 342, 100
Other lumber	1, 110, 400
Mine timbers	4, 725, 600
Fuel wood	740, 900
Fence posts	63, 000
Maple syrup and sugar	37, 500
All products	9, 019, 500

Local lumber used in the mines, together with mine timbers, accounted for 78 percent of the total value of primary forest products. Landowners received nearly $2,000,000 of the total value for trees removed from their properties.

The region has a number of secondary forest-products industries. The most important of these is furniture manufacture, with about 37 plants scattered over eight counties. There are also some 20 plants that produce cardboard boxes and similar products. Five planing mills employ more than 20 persons each, and there are about 60 smaller ones. Several spool and bobbin factories in the northeastern section contribute to the needs of the textile industry. Barrels and kegs, wooden heels, coat hangers, tool handles, and wooden truck and automobile bodies are manufactured on a small scale in several localities.

At present four-fifths of the expenditure for forest raw materials used by manufacturing industries goes outside the region. The planing mills, many of which fabricate lumber into finished building materials, obtain only about one-third of their requirements locally. The handle plants and barrel and keg factories are largely dependent on local supplies. But the far more important furniture factories rely little on regional raw materials, and the paper-box manufacturers not at all. The value added by manufacture in 1943 amounted to:

Planing mills	$1, 259, 200
Furniture manufacture	3, 656, 200
Other wood manufacture	1, 000, 000
Paper-box manufacture	1, 769, 000
All wood-using industries	7, 684, 400

Local retail lumber yards purchase considerable lumber from other sections. Practically all raw materials used in the region could have been produced there if its forests had been properly managed over past years. The total cost to local industries of forest products brought into the region in 1943 is estimated as follows:

Mine lumber	$1, 050, 000
Retail yard lumber	1, 500, 000
Mine timbers	456, 000
Planing mills	610, 400
Furniture manufacture	2, 621, 700
Other wood manufacture	200, 000
Paper-box manufacture	1, 874, 400
Total cost	8, 312, 500

Forest-Industry Employment

All together, the forest products industries of the region accounted for about 7,100 man-years of work in 1943 (fig. 16). This included the organizations engaged in management of public and private forest lands and those set up to prevent and control forest fires and insect depredations. The total wages paid amounted to $8,800,000. More than one-third of the work was in logging and hauling raw materials, nearly a quarter in sawing and milling lumber and manufacturing handles and barrels from native resources, and the remainder of the work in those manufactures that are almost entirely dependent on raw material from other sections.

Much of this work is seasonal and intermittent; so the number of persons who owe their livelihood at least in part to the forest products industries is considerably more than 7,100. Some of the mine-timber and saw-timber production and virtually all the fuel-wood and fence-post production are off-season work done by farmers. Many of the sawmills and planing mills operate only a few weeks in a year. On the other hand, most of the factories operate on a year-round basis. Many of the mine-timber and larger sawmill operators also maintain continuous operation.

Wood Required for Mining

Mining requires large quantities of wood (fig. 17). By far the largest use of wood in anthracite mining is for timbers to shore up the walls and roofs of the workings. In contrast to the bituminous field, where veins are generally thin and light timbers can be used, the anthracite mines require many heavy timbers. Mine props are generally round and range from 4 to 30 inches in diameter, and from 3 to 30 feet in length. Poles vary in length up to 10 feet, with butt diameters ranging from 3 to 6 inches. Lagging is usually 2 to 4 inches in diameter and up to 6 feet long.

The mines also use considerable lumber. Rough

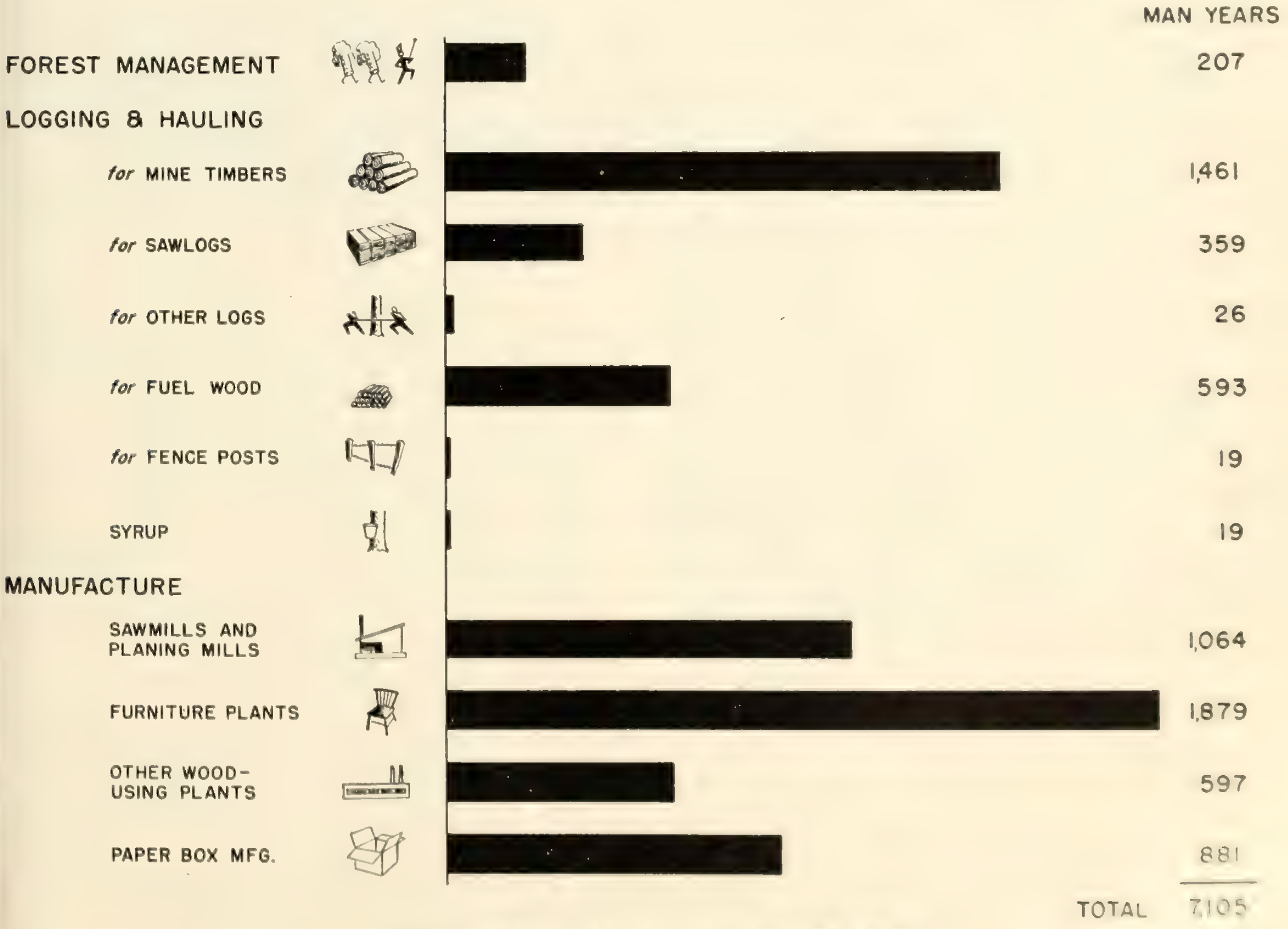
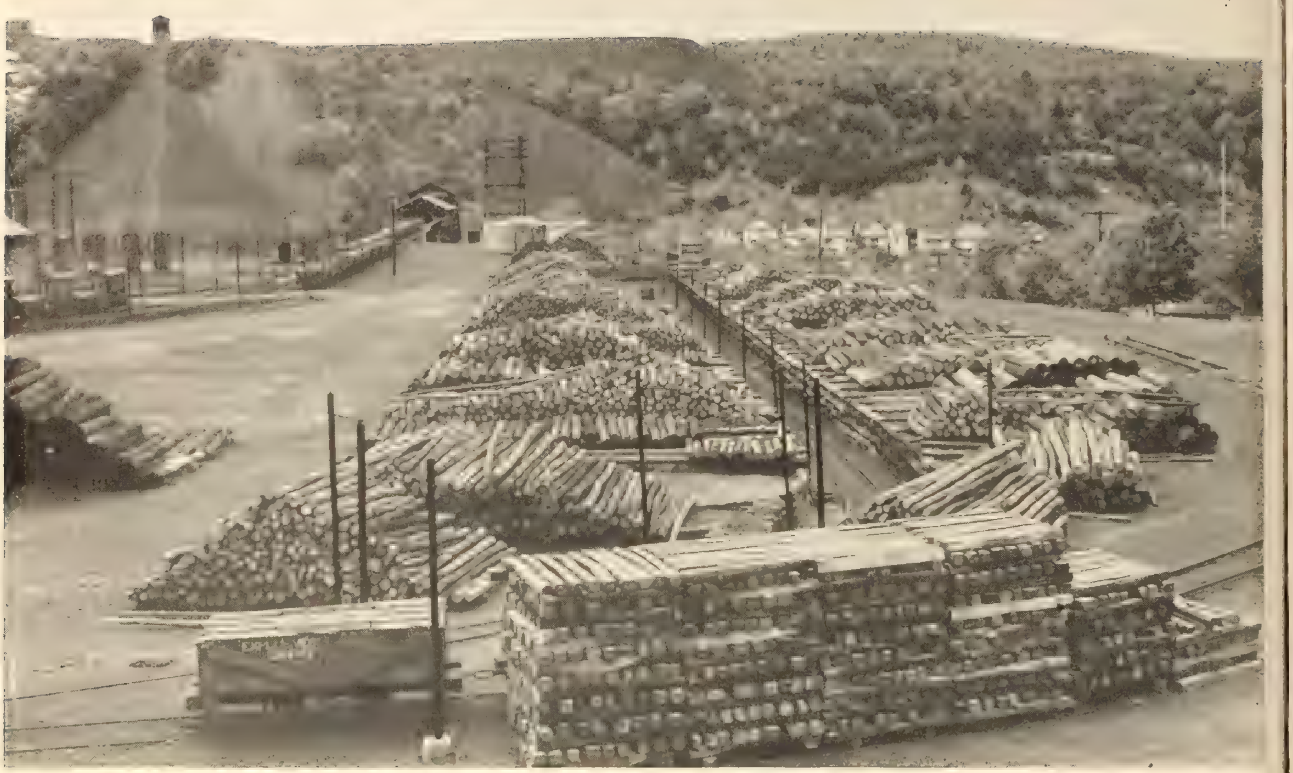


Figure 16.—*Forest and forest-industry employment in 1943.*



F-447490

FIGURE 17.—*Mining requires large quantities of wood.*

mine boards are used to form large boxes to catch the coal from steeply pitched veins. Boards are used to construct brattices that aid in directing the flow of air as it is drawn through the various passages to provide ventilation. Flumes are built of wood to conduct water above and below ground. Boards are needed also for shoring.

The lumber used in the mines does not need to be of high quality. Good oak planks, however, are needed to construct and repair mine cars. High-grade hickory is required for the springboards used to suspend screens in grading coal. Good-quality lumber is used in offices, breakers, and other mine buildings.

The mines also use large quantities of cross ties, mostly 5 inches square by 6 feet long. Sprags, double-pointed pieces of wood 22 inches long and about 3 inches in diameter, are used to brake the wheels of mine cars.

Since mine timbers need high compression strength and should be of a material that will give way gradually with a cracking sound to warn miners when there is danger of a break-down, some woods are favored over others. Mixed oaks, sugar maple, red maple, and hemlock are most frequently used. Miners say that beech does not give sufficient warning of an impending break, and even with mine timbers difficult to obtain, only a limited proportion of beech will be accepted. A few other species—aspen, pin cherry, basswood, and white pine—are also unsuited for the mines.

The diversion of transportation facilities to the war effort compelled the mines to depend to a large extent on the region's own timber resources. The inaccessibility of many stands and the rise in labor costs forced the prices for timbers delivered at the mines upward from about \$5 per ton in 1940 to \$6.50–\$7.50 per ton in 1945. Prices for mine boards similarly rose. These relatively high prices led local operators to cut into stands hitherto considered unmerchantable. Thousands of acres of young, rapidly growing forest are being clear-cut annually to supply the mines.

During 1943 mine operators imported some of their wood supplies from Pennsylvania counties adjacent to the Anthracite Region and from other states. They imported about a quarter of their mine boards (table 1) and a small portion of their mine timbers, principally larger sizes used in gangways.

TABLE 1.—*Source of wood required by the anthracite industry in 1943*

Source	Round timber			Lumber	
	Thousand tons	*Million cu. ft.*	*Percent*	*Million bd. ft.*	*Percent*
Local	755	26.5	94	48.3	74
Imported	57	1.6	6	16.8	26
Total	812	28.1	100	65.1	100

The Lumber Industry

In the latter part of the nineteenth and early in the twentieth century, especially in the northern and eastern counties, large-scale lumbering overshadowed mine-timber operations. Hemlock was felled for its tanning bark; pine and various hardwoods were cut for lumber. At one time the whole section from Sullivan County to Monroe was dotted with large sawmills.

The lumber industry still survives, but it is much smaller than it was. In 1942 there were 263 sawmills in the region, including many small portable mills (figs. 18 and 19). Of these:

- 35 were idle.
- 63 produced less than 50 thousand board feet.
- 116 produced between 50 and 500 thousand board feet.
- 33 produced between 500 thousand and 1 million board feet.
- 16 produced more than 1 million board feet.

In all, the mills produced about 69 million board feet of rough lumber in 1942, more than half of it in Sullivan, Susquehanna, and Wayne Counties. About 85 percent of this was used within the region; the rest was shipped outside. Very little construction lumber was used locally during the war. A large proportion of the local buildings are in need of repair, however, and lumber sales probably have increased since the war.

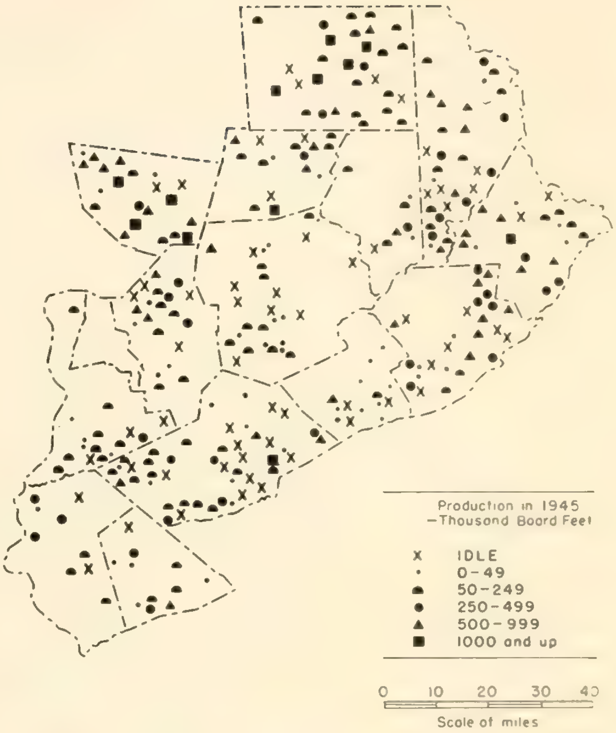


FIGURE 18.—*Location of sawmills in 1945.*

FIGURE 19.—*There are many small portable mills.*

Farm Woodlands

Most of the 25,000 farms include some forest land, which supplies the owners with building materials, fence posts, and fuel wood. In the northern counties a small quantity of maple syrup is made; pr[illegible] amounted to 10,300 gallons in 1939

Many farm woodlands also supplement cas[illegible]

The Bureau of the Census reported that the volume of forest products sold from farms in the region in 1939 amounted to $253,469. Sales probably have been larger during recent years because of war-stimulated cutting and higher prices. Many farmers earn additional income during periods when farm work is slack by logging or milling. Even now, farmers could realize more from their woodlands than they do, by performing more of the woods work themselves. Improvement of the farm woodlands could lead to a considerable increase in income from forest products.

THE PRESENT FOREST SITUATION

Condition of the Forests

The forests as a whole are in better condition than the areas in the immediate vicinity of the coal fields and in some parts of the Pocono Plateau would indicate. Their condition, however, is far from satisfactory. Even after 40 years of effort to improve this condition, less than one-quarter of the forest is in merchantable[10] stands (fig. 20).

Unmerchantable Stands

The unmerchantable forest is not a mere desolation. Some of it is in saw-timber or pole-timber stands of less than 10 acres, but usually too isolated for profitable operation. A large proportion is in fairly well stocked young growth of commercial species. The

---

[10] Merchantability in the Anthracite Forest Region is largely dependent on the demand for mine timbers. Under present market conditions, operators will cut into stands of 10 acres or more which have as little as 5 cords per acre in trees 5.0 inches and larger in diameter. Merchantable saw-timber stands are those 10 acres or larger which have at least 2,000 board feet lumber tally in softwood trees 9.0 inches and larger in diameter, and hardwood trees 11.0 inches and larger. The remaining areas which meet the minimum standard for mine-timber operation have been classed as merchantable pole-timber stands. Unmerchantable stands include seedling, sapling, and denuded areas; and saw-timber and pole-timber stands of less than 10 acres, whether isolated tracts or parts of larger forest areas.

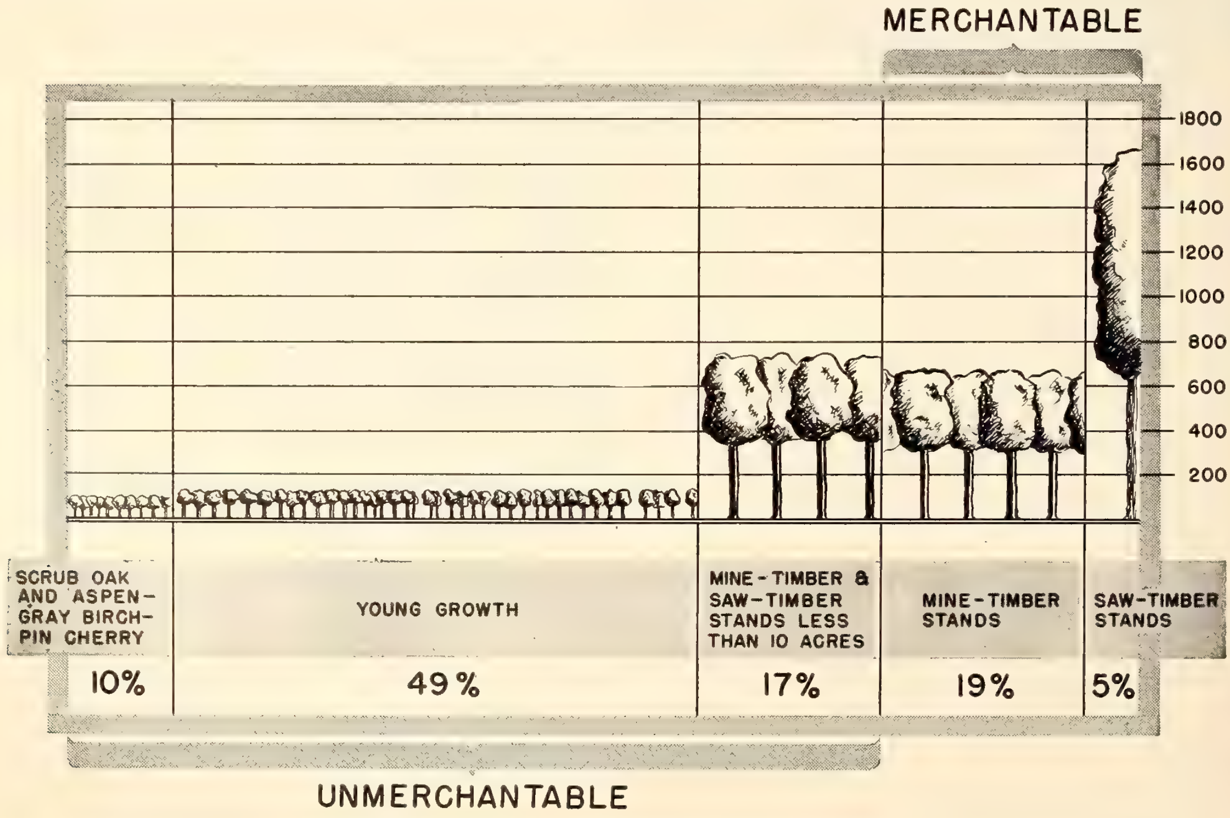
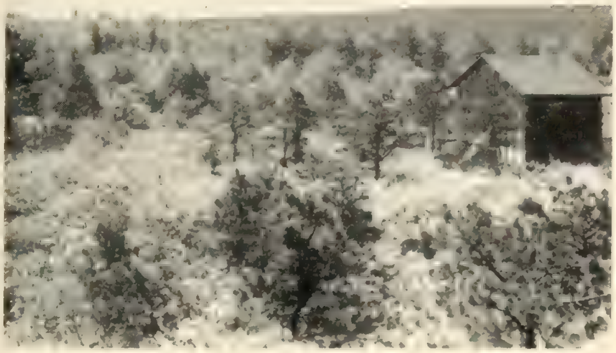


FIGURE 20.—*Less than one-quarter of the stands are merchantable.*

increasingly effective control of fire has enabled about two-thirds of this young growth to attain an age of 11 to 40 years; the rest is younger. Much of the growth less than 11 years old is in the oak types, where fire and clear-cutting of immature stands have been most prevalent. The remainder of the unmerchantable forest area is thinly stocked and dominated by scrub oak and aspen, gray birch, and pin cherry (fig. 21).



F-447492

FIGURE 21.—*Many square miles bear only stunted pitch pines, gray birch, and scrub oak.*

Although the unmerchantable stands are largely not suitable for logging at present, they contain more than one-third of the saw timber in the forests of the region, and over half the tonnage in other material (table 2). This vast area is a challenge and an opportunity. Good forest management can speed up the process of converting these understocked forests into productive, merchantable stands.

TABLE 2.—*Forest area and timber volume, by condition class*

Condition class	Forest area	Saw timber	Other material (green weight)
Merchantable stands:	*Acres*	*M bd. ft.*	*Tons*
Saw timber	177, 400	838, 000	4, 875, 200
Pole timber	614, 500	425, 800	9, 803, 800
Unmerchantable stands	2, 406, 500	871, 800	14, 950, 300
Total	3, 198, 400	2, 135, 600	29, 629, 300

Merchantable Pole-Timber Stands

Most of the merchantable pole-timber stands are made up of second or third growth following clear-cutting. A large proportion of the trees in the oak types are sprout growth; trees from seedlings predominate in the sugar maple-beech-yellow birch and white pine-hemlock types. The principal species, and the proportion of the gross cubic-foot volume, including bark, which each represents, are as follows:

	Percent
Red, white, chestnut oaks	24
Red maple	14
Hard maple	11
Ash and basswood	11
Beech	10
Birch	8
Other hardwoods	9
Hemlock and pitch pine	9
Other conifers	4
	100

Less than a quarter of the tonnage in merchantable pole-timber stands is in trees 11.0 inches or larger (fig. 22).

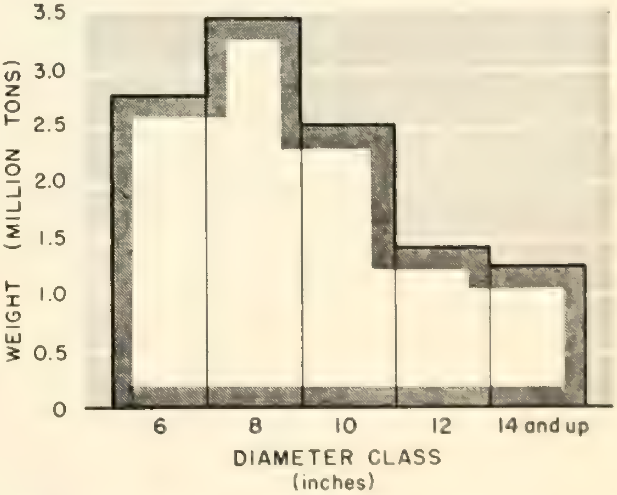


FIGURE 22.—*Diameter-class distribution by green weight of all material in merchantable pole-timber stands.*

Merchantable Saw-Timber Stands

The merchantable saw-timber stands are either at some distance from the mining sections or in farm woodlands; thus they have escaped the intensive utilization (fig. 23) of areas nearer the mines or have been reserved for recreational purposes or for watershed purposes around reservoirs. These stands average about 4,700 board feet per acre and range from a minimum of 2,000 board feet up to 18,000. Because of the wide range in volume per acre, these areas have been further classified as follows:

Board feet per acre:	*Acres*
8,000 or more	24, 500
6,000 to 7,999	24, 700
4,000 to 5,999	40, 100
2,000 to 3,999	88, 100
Total	177, 400

F—447493

FIGURE 23.—*Some saw-timber stands have escaped intensive utilization.*

The rapid growth of conifers and the location of the merchantable saw-timber stands in the sugar maple-beech-yellow birch and white pine-hemlock forest types are reflected in the proportional composition of saw timber by species:

	Percent
Hemlock	19
Beech	17
Oaks	16
White pine	12
Hard maple	9
Red maple	8
Other hardwoods	18
Other conifers	1

More than a quarter of the board-foot volume in merchantable saw-timber stands is in trees 19.0 inches and larger (fig. 24), but there are very few trees that exceed 30 inches.

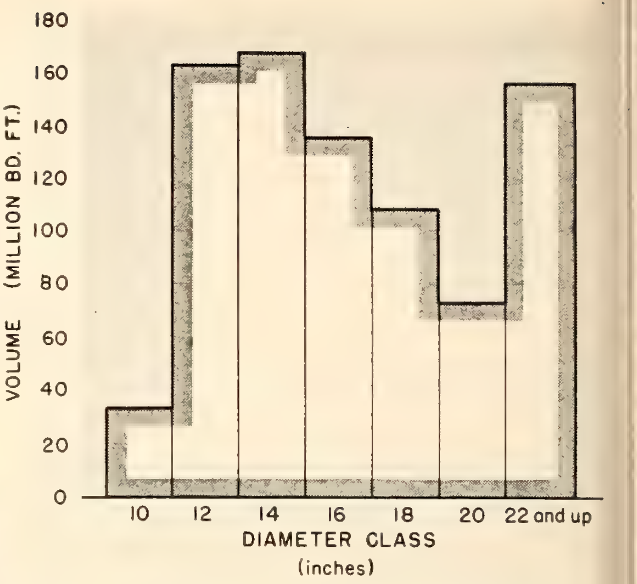


FIGURE 24.—*Diameter-class distribution of board-foot volume in merchantable saw-timber stands.*

Major Forest Types

Seven principal forest types are found in the forests of the Anthracite Forest Region (tables 3 and 4).

Sugar Maple-Beech-Yellow Birch

The sugar maple-beech-yellow birch type is more important than any other in the Anthracite Region. It is found only in the northern counties where it dominates the highlands, largely at elevations of about 1,200 feet. The principal species that comprise this type are beech, sugar maple, red maple, and yellow birch, with associates of white ash, black cherry, and basswood. There is considerable hemlock in the moist ravines. Nearly half the saw timber and more than half the smaller material of the region is in this type. The saw-timber stands average about 4,500 board feet per acre and the pole-timber stands about 20 tons. The species in this type grow fast and respond well to selective cutting. Fires in woods of this type are not common. In clear-cut areas, however, fire may hinder reproduction and allow the invasion of aspen, gray birch, and pin cherry. This has happened in parts of the North Mountain section and in the highlands east of the Wyoming Valley.

Aspen-Gray Birch-Pin Cherry

Stands of trembling aspen, gray birch, and pin cherry with a few remnants of red maple, black cherry, hickory, and beech are found where extensive areas of the sugar maple-beech-yellow birch forest were burned over after logging.

White Pine-Hemlock

The white pine-hemlock type occupies less than 8 percent of the forest area. This type is made up principally of white pine and hemlock in varying proportions, and for purposes of this report, pure stands of white pine and pure stands of hemlock are also included. The principal associated species are red maple and birch. The white pine-hemlock type is found chiefly on well-drained slopes and the sides of ravines. Some virgin stands still survive. Though the area occupied by this type is relatively small, it accounts for a quarter of the saw-timber area and 29 percent of the volume in saw-timber stands, and for nearly a tenth of the pole-timber area and volume. The saw timber averages nearly 5,600 board feet to the acre, the highest in the region; and the tonnage is only slightly below that in the sugar maple-beech-yellow birch stands. This type has a higher growth rate than any other and, because of the generally moist conditions of the site, is rarely damaged by fire.

White Pine-White Oak-Red Oak

The white pine-white oak-red oak type is dominant in Columbia and western Luzerne Counties, in the Blue Mountain Valley, in the watershed of the Lackawaxen River, and to either side of Mahantago Creek. It is characteristic of the fairly fertile agricultural sections in the rolling foothills. The principal species are white pine, red oak, black oak, white oak, chestnut oak, and in a lesser degree red maple. On the whole, this type is found on moister sites than the other oak types and is less susceptible to fire. The proportion of white pine is high (27 percent), but there is some reason to believe that the proportion is decreasing as a result of clear-cutting. Seedling pines are apt to be stifled by oak sprouts in stands of this type.

TABLE 4.—*Net volume in each major forest type, by class of material*

Forest type	Sawlog material	Other material	All material
	M bd. ft.	*Tons*	*M cu. ft.*
Sugar maple-beech-yellow birch	867, 200	12, 268, 500	572, 930
Aspen-gray birch-pin cherry	4, 400	702, 800	28, 620
White pine-hemlock	386, 000	2, 894, 400	173, 160
White pine-white oak-red oak	380, 200	5, 337, 000	259, 610
Red oak-black oak-white oak	448, 500	7, 473, 300	308, 540
Chestnut oak	37, 200	670, 400	28, 550
Scrub oak	4, 000	150, 300	5, 950
Other	8, 100	132, 600	6, 130
All forest types	2, 135, 600	29, 629, 300	1, 383, 490

Red Oak-Black Oak-White Oak

The red oak-black oak-white oak type is dominant along the slopes of ridges and in the comparatively flat, fertile farm land of Dauphin, Lebanon, Montour, and Northumberland Counties. It consists almost entirely of various species of oak. The principal associated species are red maple, pitch pine, white ash, basswood, and aspen. This type occupies nearly as many acres as the sugar maple-beech-yellow birch type, but is in much poorer condition. It accounts for only about one-eighth of the saw-timber volume and less than a fifth of the tonnage of the region. Because of the frequent clear-cutting for

TABLE 3.—*Distribution of forest area of each major forest type, by condition class*

Forest type	Merchantable stands				Unmerchantable stands		All stands	
	Saw timber		Pole timber					
	Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
Sugar maple-beech-yellow birch	82, 700	46. 6	315, 300	51. 3	524, 700	21. 8	922, 700	28. 9
Aspen-gray birch-pin cherry			6, 600	1. 1	91, 500	3. 8	98, 100	3. 1
White pine-hemlock	43, 800	24. 7	57, 900	9. 4	144, 800	6. 0	246, 500	7. 7
White pine-white oak-red oak	23, 000	13. 0	95, 800	15. 6	536, 500	22. 3	655, 300	20. 5
Red oak-black oak-white oak	26, 000	14. 7	122, 800	20. 0	766, 400	31. 9	915, 200	28[illegible]
Chestnut oak	1, 500	. 8	15, 000	2. 4	99, 300	4. 1	115, 800	[illegible]
Scrub oak					231, 500	9. 6	231, 500	[illegible]
Other	400	. 2	1, 100	. 2	11, 800	. 5	13, 300	[illegible]
All forest types	177, 400	100. 0	614, 500	100. 0	2, 406, 500	100. 0	3, 198[illegible]	[illegible]

mine props, 84 percent of this type is now unmerchantable. On the other hand, much of this is young stock that, if protected, will develop into valuable forests. Fire has been frequent in the oak areas, especially in the vicinity of the coal fields, and, as a result, many acres are occupied by scrub oak stands.

Chestnut Oak

The chestnut oak type is found chiefly on poor sites along the tops and southern slopes of ridges in the central and southern parts of the region. Chestnut oak makes up half the volume of this type; red oak, hemlock, red maple, and white pine are the principal associated species. On the whole, this type is not of much commercial value. It contains some saw timber and mine timber, but most of the chestnut oak stands are unmerchantable. Furthermore, a large proportion of them grow in relatively inaccessible places. Like the other oak types, the chestnut oak type is highly susceptible to fire.

Scrub Oak

Scrub oak is prominent at the higher elevations where the soil is thin and rocky and fires have been frequent. Pitch pine, which is rather fire-resistant, is the most important commercial species in the scrub oak stands. A small proportion of the red, black, white, and chestnut oaks give promise for future stands if fire is kept out.

Current Growth and Drain

The growing stock in the Anthracite Forest Region does not yield a large return. Growth is at an extremely low level. The growth of saw timber is too small to meet the present drain. In smaller material the surplus of growth over drain is attributable to the growth in unmerchantable stands.

Growth

Estimates of growth per acre in each major forest type and forest condition class for 1943 are given in table 5. Cubic-foot growth has been estimated for all trees 5.0 inches d. b. h. and larger; board-foot volume for conifers 9.0 inches, and hardwoods 11.0 inches d. b. h. and larger. When trees reach these sizes they attain measurable volume. Growth is therefore recorded not only for increases in size of trees already within the measurable limits but also for additions to the measurable sizes from below.

TABLE 5.—*Growth per acre in each major forest type, by condition class, 1943*

SAWLOG MATERIAL

Forest type	Saw-timber stands	Pole-timber stands	Unmerchantable stands	All stands
	Board feet	*Board feet*	*Board feet*	*Board feet*
Sugar maple-beech-yellow birch	210	48	44	60
Aspen-gray birch-pin cherry	......	18	2	3
White pine-hemlock	248	56	51	87
White pine-white oak-red oak	192	62	25	36
Red oak-black oak-white oak	172	55	19	28
Chestnut oak	113	52	7	14
Scrub oak	......	......	1	1
Other	225	82	31	41
Average, all types	211	52	25	40

ALL MATERIAL

Forest type	Saw-timber stands	Pole-timber stands	Unmerchantable stands	All stands
	Cubic feet	*Cubic feet*	*Cubic feet*	*Cubic feet*
Sugar maple-beech-yellow birch	65	45	29	38
Aspen-gray birch-pin cherry	......	22	18	18
White pine-hemlock	63	40	22	34
White pine-white oak-red oak	54	39	23	26
Red oak-black oak-white oak	45	37	22	25
Chestnut oak	31	27	14	16
Scrub oak	......	......	2	2
Other	60	37	31	33
Average, all types	60	41	21	27

The rapid growth of dominant sawlog-size white pine and hemlock is reflected in the high average growth per acre of this type. The sugar maple-beech-yellow birch type also shows good growth. Although this type comprises only 28 percent of the total forest area, it accounts for 48 percent of the current annual growth in saw-timber volume.

Commodity Drain

The forests of the region are intensively utilized. The demands for mine props, mine ties, and lagging result in the full utilization of the wood in trees felled except where distance from the mines is so great that transportation costs prohibit the use of the smaller material. The saw-timber size white pines and the higher-quality hardwoods are often manufactured into lumber, but the greater part of this timber goes into lower valued products (fig. 25). Even fuel wood and fence posts are at times produced from saw-timber material. Although anthracite mines do require large quantities of heavy props for gangways, the high-grade logs could be sorted out and sold for higher prices. Some high-quality white ash and other valuable species now go into the mines. Proper utilization of the quality timber could substantially increase the region's income now, and with good forest management could result in several times the present income and employment.

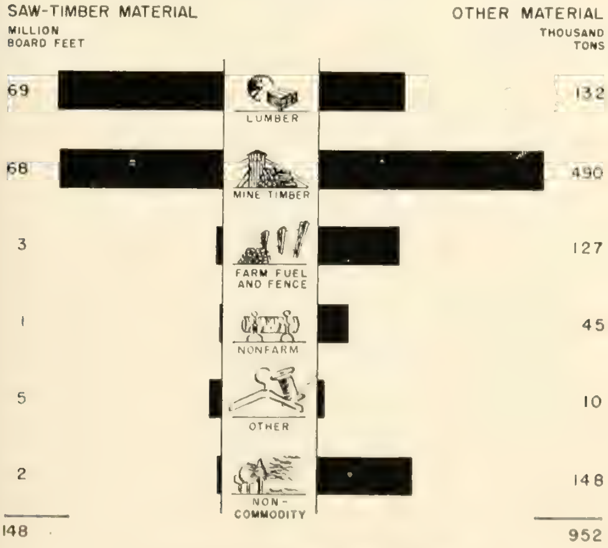


FIGURE 25.—*Forest drain in 1943.*

In 1943 about 12,500 acres of the merchantable saw-timber stands were cut over to meet the demands of the various industries. Most of the saw-timber material thus removed passed through the sawmills on its way to the consumer. Some of it, including most of that which was too small for sawlogs, went into the mines as props and gangway timbers. In addition about 21,000 acres of merchantable pole-timber stands were cut, largely for mine timbers; and about 9,000 acres classified as unmerchantable were culled over in the course of the operations in the merchantable areas. This last amounted to only 0.4 percent of the area classified as unmerchantable. Of the total area cut over it is estimated that about 35,000 acres were clear-cut.

Drain Due to Fire, Insects, and Disease

Besides the cutting of trees for commercial purposes, there are several sorts of noncommodity drain on the forests. One of these is the damage done by insects. In some parts of the country this damage results in serious losses, but it plays a comparatively small part in the Anthracite Forest Region. In the neighborhood of the northern coal field there is a gypsy moth infestation, but Federal and State agencies have established a quarantine area and the infestation is under control. Borers and leaf-eating beetles also occur, but not in epidemic proportions, and they do comparatively little damage.

A second noncommodity drain, also of little consequence at present, is that due to disease. During the first quarter of the century the chestnut blight wiped out the chestnut trees throughout the Northeast, and only sprout growth is now to be found in the region.

Fire causes more damage than either insects or disease. Thousands of acres of forest have been destroyed by fire. The fire situation has been greatly improved by organized effort during the last quarter century, but even now the loss is great. Virtually all of the estimated noncommodity drain is the result of fire.

Inventory Change

As the result of this growth and drain, it is estimated that in 1943 the total growing stock was increased by 2.5 percent (table 6). This increase in trees 5.0 inches d. b. h. and larger is equivalent to more than 80 percent of the volume in mine timbers used in that year. Almost all of this increase in volume occurred in merchantable pole-timber stands. It is largely accounted for by unmerchantable stands attaining sufficient volume per acre (in areas [illegible] acres and larger) to be classified as merchantable pole-timber. The growth in uncut saw-timber stands and the shift of pole-timber areas to the saw-timber classification almost offset the total drain on the saw-timber stands.

The situation is not nearly so encouraging when only the higher quality saw timber is considered. The growth of saw timber in all condition classes was overcut by nearly 20 million board feet (table 7). Utilization of some of the surplus in material unsuited for sawlogs would help relieve this situation. Such an overcut in sawlog material cannot be repeated for many years without seriously jeopardizing industries now dependent upon material of above-average quality. Such cutting, however, was greatly stimulated by the war.

Prospects for the Next 10 Years

If the drain for 1943 should continue for the next 10 years, operators seeking the larger trees of higher quality would find it more and more difficult to locate them in sufficient numbers to justify logging. However, other demands upon the forest could be met, especially those for mine timbers, and the acreage of merchantable pole-timber stands would at the end of 10 years be approximately double that of 1943. This suggests an opportunity for new industries that could utilize some of the smaller growing stock in competition with the mining industry. However, the people of the region should plan eventually to develop extensive areas of high-quality material that will attract those industries requiring a large number of skilled workers and able to contribute most to the region's economy.

The problem is to find out how to meet the demands of the mines and of the other industries for low-quality material while building up the forests to meet the prospective demands for higher quality timber. This can be done without decreasing the total cut provided forest-management practices are greatly improved. A start has been made; the need is to accelerate progress.

TABLE 6.—*Inventory change in cubic-foot volume, by condition class, Jan. 1, 1943, to Jan. 1, 1944*

Condition class	1943 inventory	Total drain	Gross increment	Net change	1944 inventory
	M cu. ft.	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*
Merchantable stands:					
Saw timber	295, 400	20, 360	17, 379	—2, 981	292, 419
Pole timber	423, 200	21, 090	49, 421	28, 331	451, 531
Unmerchantable stands	664, 890	12, 340	20, 689	8, 349	673, 239
All stands	1, 383, 490	53, 790	87, 489	33, 699	1, 417, 189

TABLE 7.—*Inventory change in board-foot volume, by condition class, Jan. 1, 1943, to Jan. 1, 1944*

Condition class	1943 inventory	Total drain	Gross increment	Net change	1944 inventory
	M bd. ft.	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*
Merchantable stands:					
Saw timber	838, 000	79, 530	51, 570	—27, 960	810, 040
Pole timber	425, 800	53, 830	97, 650	43, 820	469, 620
Unmerchantable stands	871, 800	14, 330	—20, 330	—34, 660	837, 140
All stands	2, 135, 600	147, 690	128, 890	—18, 800	2, 116, 800

THE FOREST POTENTIAL

The forests of the Anthracite Forest Region were once fine stands of valuable species, and they still have great potentialities. It would be economically impractical to restore forests to a condition comparable to the virgin stands, but fully productive forests of commercial species can be built up. The intense demand for wood in the Northeast will almost certainly continue to provide a good market for all forest products grown. Well-managed forests will supply more than wood: they will reduce runoff and lessen the chances of serious floods, they will provide playgrounds for recreationists and habitat for abundant game. But the degree to which the possibilities will be attained and the length of time it will take to attain them depend on many factors: on the protection the forests receive, on the various constructive measures undertaken to build up the stands, on the amount of timber cut each year and the care and foresight used in cutting it, and most of all on the desire of the woodland owners and citizenry of the region to reach the goal.

The Forests Can Be Built Up

The attainable forests of the future are a far cry from the understocked low-quality stands of the present. The volume of growing stock and the annual growth can be expanded greatly; the proportion of commercial species can be raised; and even the forest area can be expected to increase.

Forest Area

The present forest area of the region is 3,198,400 acres. This could be enlarged to about 3,500,000 acres. Some of the existing forest will be destroyed by mine-stripping operations, and a small area will be cleared for cropland and pasture. But most stripped areas and most mine waste banks will eventually revert to forest. In addition, open areas near towns and on abandoned farms, and otherwise unused cleared land on active farms should be protected from fire and planted or allowed to restock naturally.

However, some of the present unmerchantable stands may never reach merchantability. Thousands of acres now in scrub oak seem to have always been in scrub oak, and these areas are probably too poor to grow desirable species to merchantable size. Some of the chestnut oak ridges should be maintained for watershed protection and recreational uses; other areas should be reserved as protection forests for railroads and highways; and additional areas might be held from commercial cutting as parks. In addition, mine waste banks and strippings which are now bare and sterile will not produce high-grade timber for many years to come, even if planted, and possibly never. Altogether, about 500,000 acres, for one reason or another, may not be available for commercial forest use.

Merchantable stands now occupy less than 800,000 acres. This area could be increased nearly four times if the young stands were allowed to grow to merchantable size, and if selective or partial cutting management were instituted throughout the region. Ultimately, well-managed forest stands could probably be operated commercially on some 3 million acres.

Timber Volume

Under management 3 million acres of forest could bear at least 20 billion board feet of saw timber and about 100 million tons (more than 3 billion cubic feet) of other material. This is an increase of more than 12 times the present volume of saw timber in merchantable stands, and of more than 8 times the present volume of other merchantable material. Such a goal cannot be attained overnight, of course; it takes years for trees to develop from seedlings into sawlogs. But the goal can be hastened by intelligent and aggressive effort.

The most important forest type in the region, the maple-beech-birch, is admirably adapted to management by the selection method. On a cutting cycle of about 10 years, the many valuable species in this type can be grown to optimum sizes, permitting mature trees to be removed from fully developed stands. This would make possible an intensive utilization of the forest and would allow the production of ash suitable for handle stock, maple for flooring and veneer, cherry for furniture, and other high-quality products. Inferior species and young trees that would not develop into high-grade material could be removed as mine props or for other markets that use low-quality timber.

The white pine-hemlock and white pine-white oak types could be managed by a group-selection method to insure the reproduction and development of white pine. Hemlock is one of the species now favored for mine props, and a large proportion of the white pine lumber finds its way into the mines. Eventually these species should be utilized to a larger degree as building materials and for crating and boxes. White oak (which is associated with white pine and red oak over a large area) grows well and produces high-quality material suitable for tight cooperage and furniture. Red oak makes excellent flooring.

The other oak types could be managed on either an even-age or a selection system. Knowledge of the best methods of management for these types is meager, and research is needed to determine [illegible] best means of maintaining a high proportion of [illegible] better species. The chestnut oak ridges, if [illegible] to be cut at all, should probably be cut under a selection system in order to maintain their watershed-protection values. On poor soils the oak stands could be managed to increase the proportion of pitch pine, which is valuable for construction timber.

Forest Growth

The ultimate growth of managed stands would amount to about 650 million board feet of saw timber annually. In addition there would be an annual growth of about 2 million tons, or 70 million cubic feet, of smaller material. This constitutes an increase in annual growth of 500 million board feet of saw timber but little increase in the tonnage of other material. These estimates are based on current knowledge of potential yields. Further experience with management practices designed for optimum yields may reveal possibilities of an even higher rate of production.

Future Forest-Products Industries

Full benefit can be derived from the increase of available timber in the region only if finished products are manufactured from it. Manufacturing industries that can make the fullest and most profitable utilization of the timber grown should be encouraged.

The needs of the mining industry for low-quality material are even now more than balanced by forest growth. If good forest practices are generally adopted, it should soon be possible to establish other industries that use low-quality timber and gradually to expand them as the available supply increases. Pulp mills and hardwood-distillation plants fall into this category.

The prospective increase in high-quality timber is much greater than that of low-quality timber; and efficient utilization of this is the principal future need of the region. The existing wood-using industries, especially the furniture plants, could use much of this material. Ultimately, however, the available quantity of high-grade timber could be much greater than these industries can use, so that a considerable expansion is possible.

At present relatively little wood is wasted in the Anthracite Forest Region because all sizes are used for mine timbers. But as the forests are built up, a larger proportion of the volume can be sawed into lumber and made into other products. Then the establishment of industries to utilize waste wood from manufacturing would add to the total value of the forest products of the region and would require more men. Cellulose products and plastics are among these possible byproducts.

Ultimate Employment and Income

The increase in timber volume will enlarge the number of products that can be made in industries, and more labor will be required. It is safe to say that the development of fully productive forests throughout the region will make possible the employment of 30,000 persons in woods work and dependent industries, and provide an approximate income from the forests, at 1943 scales, of $75,000,000. This is in contrast to 1943 employment of 7,000 men and returns of $17,000,000 from the forests.

The progress of the last 20 years in the development of new wood products has been so great, and the promise of further progress in the future is so good, that definite predictions are impossible. There apparently will always be a demand for high-quality boards and planks and timbers. Each year brings the discovery of new uses for wood, and the economic consequences of these discoveries may be great. The valuable new molding wood, hydroxylin, which is made from hardwood waste and could be produced in considerable quantities in the Anthracite Forest Region, is but one example of the changes in wood utilization that are taking place. The future of any wood-producing area may be different from anything that is now foreseen. "Wood today is no longer just boards and planks and timbers—however important these still are. It is food, clothing, and many things, the list of which is daily lengthening . . . The potentialities are vast and challenging." [11]

---

[11] Winslow, C. P. Wood's Role in Today's World. American Lumberman 3260: 144–149, illus. 1943.

A PROGRAM FOR IMMEDIATE ACTION

The attainment within a reasonable period of fully productive forests and the benefits they yield requires aggressive action now. Although increases during the past decade in measures designed to improve the forest situation are encouraging, much more needs to be done. The prevention and control of forest fires can be intensified. The restocking of large areas can be speeded up through planting. Clear-cutting practices should give way to sounder methods of forest management. Watersheds contributing to floods would benefit from improvement measures. Steps could also be taken immediately to expand recreational facilities and game resources.

Intensify Fire Protection

Prerequisite to all plans for the development of the forest resources is the better control and, so far as possible, the prevention of fire. Programs such as that instituted by the Wyoming Valley Chamber of Commerce in cooperation with the Pennsylvania Department of Forests and Waters should be extended as soon as possible throughout the region.

A high degree of local responsibility helps to reduce the number of fires and to improve detection and control. Spotters who can watch for fire while engaged in their regular occupations might be trained to report fires in areas not readily visible from fire lookout towers. Local fire-fighting organizations, also made up of volunteers, could be expanded. Paid fire fighters would then have to be called out only when the hazard is great or fire gets out of hand. Fire-danger stations, manned by paid experts, could be set up at key points to make day-by-day estimates of fire danger during fire seasons and to keep the fire-spotting and fire-fighting organizations informed.

In addition, fire-prevention methods, such as cutting and plowing fire lanes and burning safety strips along highways and railroads, should be carried on much more extensively than at present. More access roads to remote parts of the extensive forests are vitally needed. Public support is essential in all of this work and every means should be utilized to build up a genuine popular desire to cooperate.

Plant Waste Areas

Several planting projects should be undertaken as soon as seedlings can be made available. In all, it is estimated that there are approximately 200,000 acres in need of planting.

Unused Areas Near Towns

Town forests and school forests could be planted on idle areas near towns. Immediate returns, of course, would not be apparent, but such planting would help to build up an interest in forest conservation. If the people themselves plant and care for these forests, each group will come to feel that the forest is theirs and, in consequence, will want to protect it. Eventually such forests will provide a source of timber and income and will serve as recreational areas.

Mine Waste Banks

In general the tree species that will grow on mine waste banks do not grow to commercial size. It therefore seems impractical under present knowledge to plant waste banks unless they cause damage to individuals or to other places than the land on which they stand. However, many of the mine waste banks, especially those in towns and those from which silt washes into the streams, might well be planted now. Recent legislation provides a program for cleaning up the Schuylkill River; prevention of coal silting by planting or otherwise stabilizing waste banks at the river's source would aid this program.

Surface Strippings

Although natural afforestation will gradually take place on the unsightly banks of soil, shale, and sandstone thrown up in the process of digging for coal, the establishment of a forest cover could be attained earlier through planting. However, the deep ditches from which coal has been removed are difficult to plant. Some of them that have become filled with water could be developed as recreational lakes.

Unused Farm Land

On going farms, open areas with poor soil generally should be put back into forest. Steep, open ridges where the danger of erosion is great should also be forested. Some of these open areas will quickly be restocked by seed trees along their borders, but others return to forest slowly and should be planted. Furthermore, natural reforestation on such areas may result in stands of inferior species or species that do not meet the needs of the locality. For example, in some areas the supply of softwoods for construction is insufficient; here suitable softwood species should be planted.

Some abandoned farm lands will restock naturally, but many will require planting. Extensive areas, especially in the northern counties, could be consolidated by public agencies into tracts large enough to warrant constructive management.

Improve Timber Stands

Improvement cuttings, thinnings, and weedings could be made now in many stands; they would provide a large proportion of the props and lagging required by the mines and at the same time would improve the forest. Adoption of sound forest-management practices in place of the prevalent clear-cutting methods would benefit the forests immediately.

Harvest cuts should not exceed 40 percent of the total board-foot volume in sugar maple-beech-yellow birch saw-timber stands. Clean-boled, straight, vigorous trees of sugar maple, black cherry, ash, and other valuable species should be reserved for future cuts. Such stands will yield high-quality timber in 10 to 15 years.

Dense second-growth stands can be improved through the removal of large, limby, or crooked trees. Even overcrowded young sapling growths will benefit from the weeding out of undesirable trees.

Harvest cuts should be lighter in the oak saw-timber stands: no more than about 30 percent of the total board-foot volume should be removed. These stands have numerous deformed and injured trees that should be utilized now, leaving clean-boled straight trees of the superior species. Well-managed oak stands will replace the volume cut in 14 to 20 years. In thinning oak stands it is generally desirable to cut all sprouts in a clump or none at all. In areas where white and pitch pine occur with the oak these species are generally more valuable than the oak sprouts. In this case the oak may be cut clear, leaving vigorous, healthy-crowned pine seed trees. Where pine seedlings are overtopped by oak sprouts, it is desirable to remove the competing growth until the pine attains dominance.

Steps should be taken to keep cattle out of farm woodlands. This is essential to the establishment of young trees in hardwood forests. By browsing, cattle destroy tree reproduction; they slow up in some measure the growth of the older trees. Fencing will result in greatly improved conditions in the farm woodlands of the region if, in addition, sound forest-management practices are adopted.

Improve Watersheds

Local floods, an increasing mine-water problem, reduction in local water supplies, soil erosion—these problems are all aggravated by lack of adequate forest cover. Good forest cover can reduce, but not altogether eliminate, the effects of floods. Planting open areas or increasing the stocking of forests at the headwaters and along the upper courses of streams would improve the watershed conditions in the area. Cutting operations should avoid removing any large part of the cover from steep slopes. Fires must be kept out in order to preserve the water-absorbing duff that accumulates under a protected forest. These measures should be supplemented by engineering works designed to control the waters from exceptionally heavy rainfalls.

A program of landslide prevention in the Lehigh Gorge and other areas where steep slopes overhang railroads is essential to the protection of lives and property. A combination of forestry and engineering is needed to stabilize the steep slopes.

To bind the soil and reduce surface runoff on the slopes where these slides occur, trees and shrubs should be planted, especially pitch pine, red oak, and hemlock. Where the slopes are cultivated, contour farming and terracing are needed. Fire-prevention and control programs are needed to protect the vegetation on these slopes. Measures needed include the burning of safety strips along the railroads and at intervals up the slopes, the burning of accumulated dead leaves, installation of more effective spark arresters and ashpans on locomotives, and fire patrols on high-hazard days. Engineering work needed includes the blasting away of loose boulders, stabilization of rocky slopes by retaining walls and planting, ditches at the tops of slopes to control surface runoff, and tapping and ditching of subterranean streams.

Public and Private Responsibility

The responsibility for developing the forests is both private and public. Since 85 percent of the forest land in the region is privately owned it is only reasonable that some of the responsibility for rehabilitation be assumed by private landowners. On the other hand, the public as a whole also has a stake in the development of the forests. Conditions at the headwaters of streams affect the welfare of an entire watershed, as repeated floods make clear. The ability of a forest to maintain continuous production is a factor of considerable importance in the economic vitality of any forested area. Local and State governments are largely dependent for income on taxable resources; and as the coal resources decline, the forests will have to carry a larger share of this burden.

Some activities probably will have to be financed entirely from public funds. The cost of fire prevention in Pennsylvania is assumed by the State, with financial cooperation from the Federal Government; and the expansion of prevention facilities, such as the building of new lookout towers and access roads and trails, is largely a public responsibility.

Planting programs also will need some measure of subsidy. Provision of planting stock at a nominal cost to farmers has already proved of value and should be continued. Recently enacted State legislation may enable Pennsylvania to extend this service to other owners; but the Federal aid that has been given under the Clarke-McNary and Cooperative Farm Forestry Acts could be given to such an extended service only upon the enactment of new legislation or the amendment of the existing laws. State and Federal aid might justifiably be given also in the planting of town and school forests. The high costs and long-deferred returns will make scrub oak conversion a prohibitive undertaking without some public aid.

Some private owners should share the financial responsibility. The coal companies could assume at least part of the cost of planting mine waste banks and strippings. The railroads, which would be the chief beneficiaries of a stabilization program for the Lehigh Gorge and similar areas, might contribute substantially to such projects.

Some activities will pay their own way. Practically all of the wood obtained in timber-stand improvement, for example, can be used in the mines as props and lagging. It is estimated that from a quarter to a half of the requirements of the mines could be supplied from this source. The cost of improving the State game lands does not come out of general taxation but is defrayed for the most part by license fees paid by hunters and fishermen.

Employment Required

The Anthracite Forest Region has been finding it increasingly difficult to absorb all its employables since the war. If this should become serious, the State and Federal Governments could help by underwriting an extensive program of forest rehabilitation.

The department of forests and waters has already outlined a postwar program of work on State forests. The projects include: Timber-stand improvement; seed collection; tree planting; ribes eradication to reduce white pine blister rust; stream improvement; the building and maintenance of roads and trails; safety-strip burning; the maintenance of fire towers; the construction and maintenance of telephone lines; the construction and maintenance of dams, bridges, camping grounds, buildings, and fireplaces in recreational areas; surveys; and boundary marking.

Detailed plans should be drawn up for privately owned lands as soon as possible. Rough estimates have been made for work on private lands, on the assumption that some 40 percent of this land is in the hands of owners who would collaborate in such a program. Neither gypsy moth extermination nor landslide-stabilization projects have been included. The estimates total about 25,000 man-years of work, which probably should be spread over a 5-year period.

Project:	*Man-days*
Timber-stand improvement	2, 660, 000
Reforestation	400. 000
Surveys, experiment, etc	4, 300
Disease eradication	199, 000
Fire prevention	136, 900
Road and trail construction	2, 016, 600
Dams and bridges	246, 500
Buildings, signs, etc	160, 100
Springs, streams, ponds, etc	110, 300
Wildlife protection	58, 000
Recreational developments	113, 000
Leveling strippings	125, 000
Miscellaneous	23, 000
Total	6, 250, 000

The game commission has also prepared a postwar program for the game lands. This includes construction of access roads, establishment of refuges, planting of open areas, and stand improvement designed to increase the proportion of trees and shrubs favorable to game.

A LONG-RANGE PROGRAM

Fully productive forests and maximum forest contributions to the economy of the region can be attained only through improved management of the forest resource. Efforts toward this goal would be facilitated by the following programs.

Extending Public Aid

Financial Assistance

Low-interest credit may in some instances [illegible] for a program of forest improvement. Such a program might for a time cause financial loss to forest-land owners who have been clear-cutting on a short rotation for mine timbers. Credit would enable them to carry their operations over a period of curtailed cut. A source of cheap credit might also obviate the need of clear-cutting by farmers in hard times.

Forest Research

Research is largely a public responsibility. The complexity of modern research techniques, the length of time necessary to achieve results when dealing with a slow-growing crop like trees, the considerable expense entailed, and the far-reaching benefits to be derived—all point toward the public support of forest-research undertakings.

One of the greatest needs is for information on how best to manage the forests. Specific problems in need of study are: Rates of growth of species in the several forest types under various systems of management; methods of appraising the income value of timber stands; costs of growing timber and the returns therefrom; costs of various methods of felling and bucking trees and of skidding logs; methods of planting scrub oak barrens, mine waste banks, and other areas in need of planting; the relation of forest cover to mine-water control, flood control, and landslide stabilization. The Northeastern Forest Experiment Station has established a work center in the Anthracite Forest Region to study some of these problems.

Extending Public Ownership

Thousands of acres in the Anthracite Forest Region cannot be operated continuously at a profit under private ownership. Such areas could be acquired and managed either by the counties or by the State for watershed control, recreation, game management, and timber production. Public purchases might include: Areas of submarginal farm land in northern Susquehanna and Wayne Counties; many of the scrub oak areas, especially in the western Poconos; chestnut oak ridges; and some of the other oak stands of low productivity. In many cases the first use for these areas would be the production of game; therefore, in many instances the game commission would be the logical purchaser.

The gradual depletion of the anthracite deposits presents one specific problem: What will the coal companies do with their present holdings when the coal is gone? Some of these areas can be built up for commercial timber production. But most of the holdings of the coal companies are comparatively poor sites for forestry, and it would seem logical for public agencies to take them over. Only long-range management can restore these lands; only a public agency will have a sufficient long-range interest to see it through. Public recreation areas, public hunting grounds, and public forests can be built for future generations in the coal-field area.

Minimum Standards for Private Management

All these measures and aids will fall short of the goal of fully productive forests if private landowners continue current practices of clear-cutting immature timber. Some landowners will voluntarily adopt sound management practices in their own long-time interest; others, more shortsighted, are likely to continue current practices. Some form of public control would seem wise. Such control could be given through county authorities in Pennsylvania. The State, however, should set up minimum standards to be applied throughout the State. The Federal Government in turn might establish national standards by which performance in various sections may be judged.

Expansion Required

Both public and private agencies are already active in the Anthracite Forest Region, but they are insufficient to do the job that needs to be done. The public agencies are all understaffed, and one of the greatest needs of the region is an expansion of these agencies. Similarly the existing private agencies do not nearly cover the field that falls within the sphere of private responsibility.

Public Agencies

The extension service of the State College is at present limited in the forestry field. There is an extension forester with one assistant for the entire State. Necessarily the amount of personal educational and demonstrational work these two men can do in the Anthracite Forest Region is not great. The auxiliary labors of the county agents cannot accomplish much more, since a large part of their time is given over to other agricultural problems.

More articles should be published locally in newspapers and periodicals to make generally available information on woodland management and market conditions. Additional group meetings should be held for lectures and discussions and, more effective yet, demonstrations of good forestry. Short training courses in timber cruising, in the selection of trees for cutting, and in logging and marketing should be available to those who wish them. Expansion of such activities would require the services of additional extension foresters.

Although the district foresters of the Pennsylvania Department of Forests and Waters are engaged primarily in protecting the forests from fire and in managing State forests, they are available for advice on forest management. The addition of a forest-management assistant to the staff of each district forester would broaden the teaching of good forestry practice. Farm foresters could work under the supervision of the district foresters.

At least one farm forester is needed for each of the principal farm-woodland counties: Luzerne, Lackawanna, Wyoming, Susquehanna, Wayne, Monroe, Schuylkill, and Carbon. Even within the limits of the three counties where the only full-time farm forester worked, it was impossible to respond to more than a small percentage of the calls; and as the farm-forestry program becomes more widely known, these calls are becoming more frequent.

Private Agencies

The services of the industrial forester of the Wyoming Valley Chamber of Commerce and of a few other consulting foresters are available. The Lehigh Valley Flood Control Council and that at Honesdale are taking active steps in the interest of watershed improvement. But there is more work to be done than these agencies and individuals have the time to do.

In some other parts of the country industrial forestry organizations and associations of private landowners have been established to encourage forest conservation and improvement. Similar organizations in the Anthracite Region could accomplish much. These might include:

An association of commercial timberland owners

An association of mine-timber and lumber operators

An association of small woodland owners

A forestry department in the Pennsylvania Water Works Association

A joint forestry committee set up and supported by the railroads that serve the region

A forestry department in the Anthracite Institute

A joint research committee established by the manufacturers of wood products, especially furniture manufacturers, to investigate the suitability of local raw material

A flood-control council for the Susquehanna River watershed.

Cooperation for Effective Action

If individuals and organizations continue to work independently and without full knowlege of one another's plans and accomplishments, they will be unable to attain full realization of the region's potentialities. Furthermore, they will not be able to get results as fast as they could by working together. Full forest developments and utilization can come only through coordinated efforts. Many elements are involved: commercial timber operation, farm forestry, soil conservation, flood control, coal mining, recreation, public works, forest-products manufacture. No one of these can be developed without affecting the others. A fully beneficial development of any one of them can therefore be carried out only as part of a general plan.

To carry out such a broad long-range program, a permanent organization is needed whose function would be to shape a unified plan of action and to give general supervision to its execution. The purpose of such an organization would be to integrate the activities of local agencies. It could map out in detail long-range plans for the entire region and serve as a clearing house for all local programs. It could make a particular point of collecting and having available technical information not only in forestry, but in all related subjects, from soil analysis to flood-control engineering. It could serve as an employment agency, keeping files of available workers, their skills, experience, and location. It could have as members of its staff specialists whose services would be available to local organizations. In particular, it could undertake an intensive program of education to make clear to the people of the region what benefits they and their children would derive from fully productive forests.

Plans for a complex long-range program for full development of the region's forests cannot be made overnight. The forests offer the citizens of the region an opportunity to benefit themselves, their heirs, and the Nation. But the situation calls for concerted and accelerated action—at once.

Part II.—Economic Subregions

GENERAL DESCRIPTION

IN RESOURCES, land use, land ownership, and industry, the Anthracite Forest Region divides naturally into three economic subregions (fig. 26): The coal fields, the farming areas, and the extensive forests. Each subregion differs greatly from the others (table 8); each subregion has its own characteristic problems. These subregions are further divided into subdivisions, each of which has characteristics of its own.

This break-down of the Anthracite Region into three subregions is arbitrary, of course. The subregions and subdivisions are not geographic but economic units, and the various types of land use are found to some degree in all parts of the region. However, there are certain problems that overleap the subregional bounds: watersheds, and fire prevention and control are such general problems; and since mine timbers are the major product of the entire region, utilization also must be treated as an over-all problem. Nevertheless the dominant economy of each subregion is clearly defined. And since many of the problems of the area must be dealt with locally, a detailed separate study of each subregion is necessary to define the problem in each area and to suggest a solution.

Forest-Land Ownership

The most important difference among the three subregions is in the type of ownership that dominates each (table 9). In the coal fields almost two-thirds of the forest land belongs to the coal companies; all but a negligible proportion of the land owned by coal companies falls within this area. Most of the forest in the farming area is in small tracts and belongs either to farmers or to other private owners; 90 percent of the farmer-owned woodland and a large proportion of the other privately owned small tracts

TABLE 8.—*Land use by subregions; forest area classified by size of tract*

Land use	Coal fields		Farming areas		Extensive forests		Total	
	Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
Forest: [1]								
Tracts less than 10 acres	5, 300	1. 0	46, 100	1. 4	10, 900	0. 8	62, 300	1. 2
Tracts 10 to 50 acres	12, 700	2. 4	109, 800	3. 3	16, 300	1. 2	138, 800	2. 6
Tracts 50 acres and over	384, 400	73. 2	1, 367, 900	40. 6	1, 245, 000	91. 5	2, 997, 300	57. 1
All forest	402, 400	76. 6	1, 523, 800	45. 3	1, 272, 200	93. 5	3, 198, 400	60. 9
Nonforest:								
Cropland [2]	7, 800	1. 5	1, 032, 300	30. 6	19, 400	1. 4	1, 059, 500	20. 2
Mine waste [1]	60, 100	11. 5	....	....	....	....	60, 100	1. 1
Water [2]	3, 300	. 6	49, 400	1. 5	21, 200	1. 6	73, 900	1. 4
Other	51, 600	9. 8	761, 900	22. 6	48, 000	3. 5	861, 500	16. 4
All nonforest	122, 800	23. 4	1, 843, 600	54. 7	88, 600	6. 5	2, 055, 000	39. 1
Total	525, 200	100. 0	3, 367, 400	100. 0	1, 360, 800	100. 0	5, 253, 400	100. 0

[1] Based on aerial photographs taken 1937–40.
[2] Bureau of the Census, 1940.

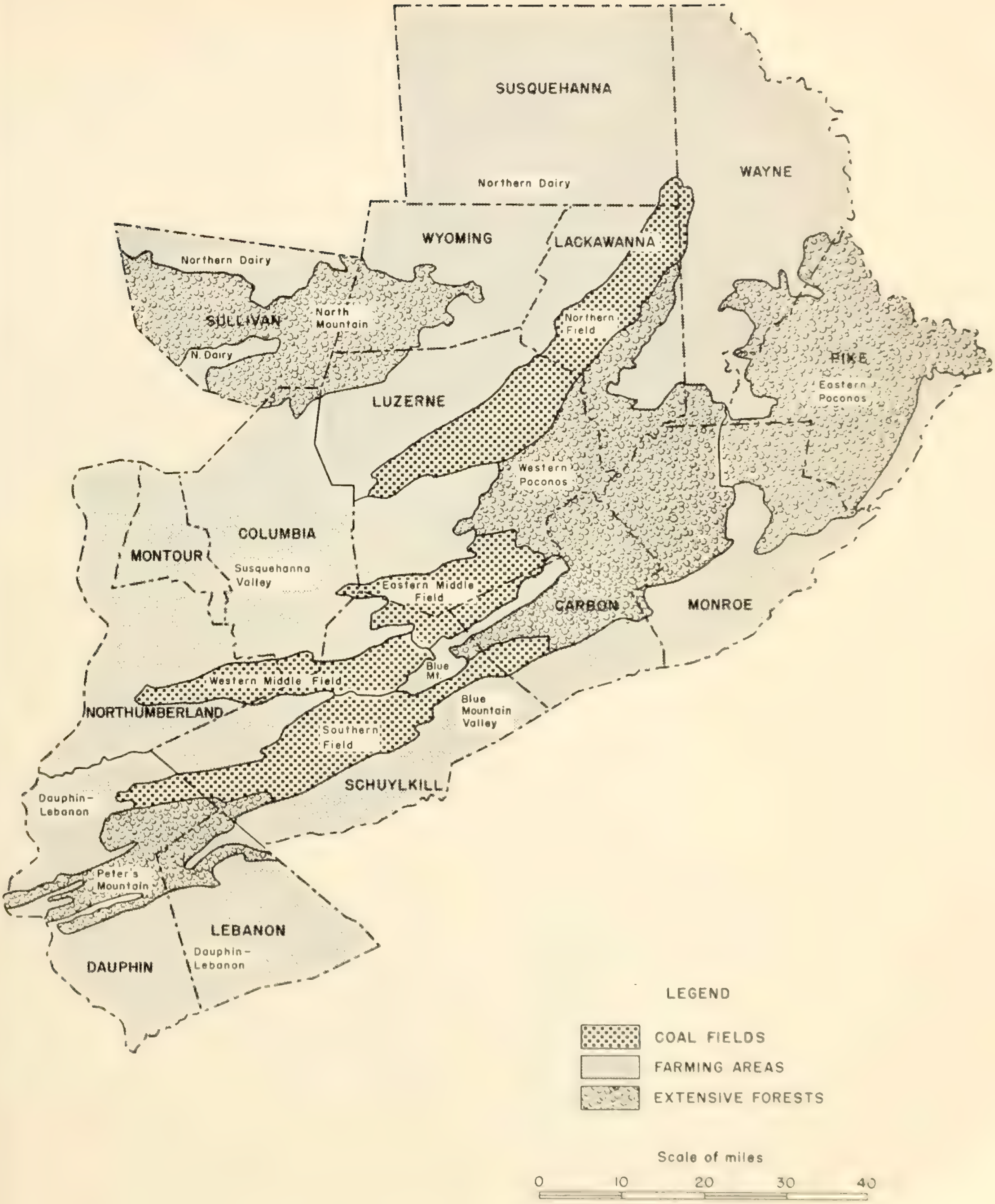


FIGURE 26.—*The principal subregions of the Anthracite Forest Region.*

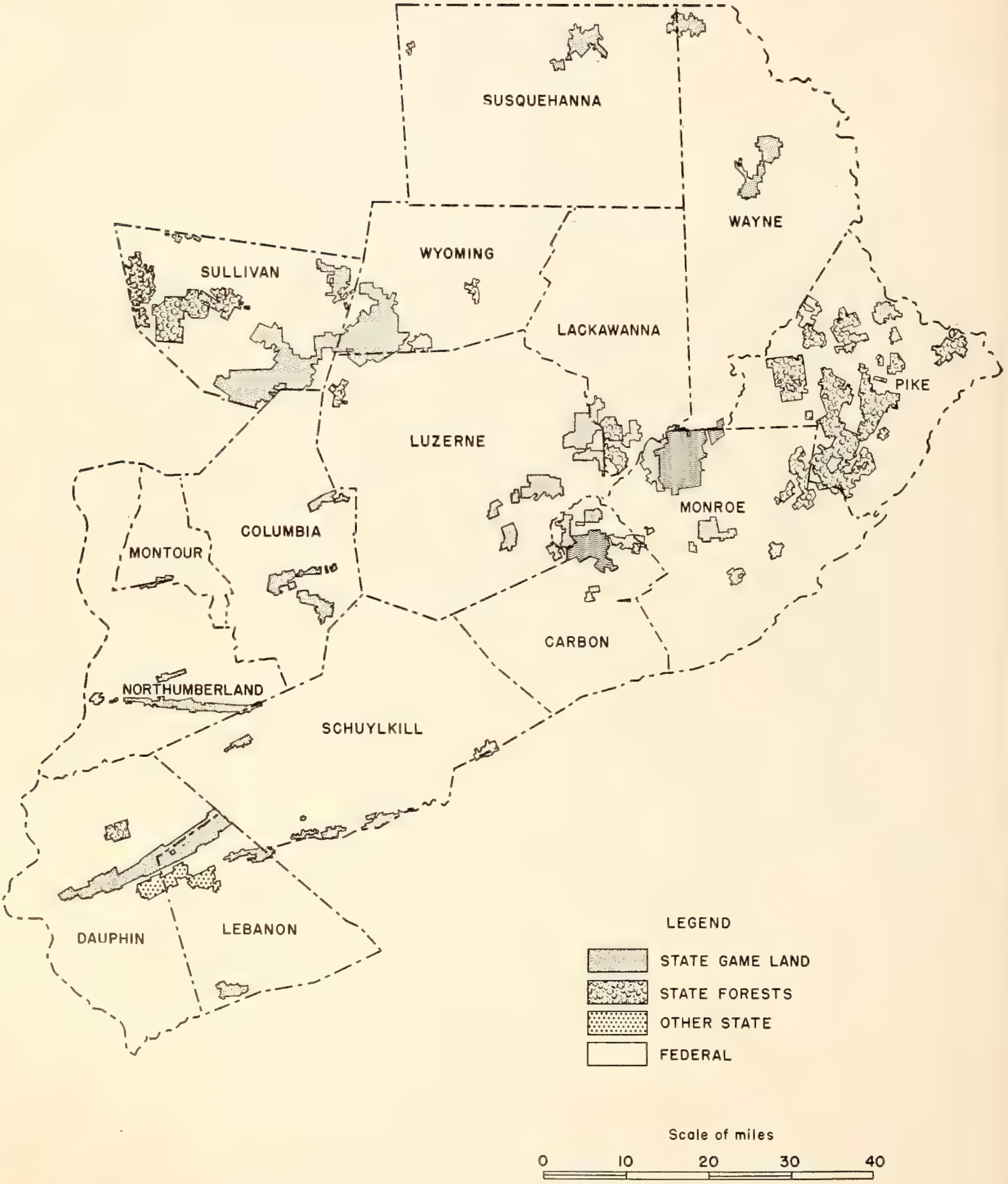


FIGURE 27.—*State and Federal ownership in the Anthracite Forest Region.*

are located here. The extensive forest area is in relatively large tracts; about a third of it is publicly owned (fig. 27). Some of the public land is in the farming area, but more than 70 percent of it is in the extensive forest area. The privately owned land in the extensive forest area belongs largely to resort owners, hunting and fishing clubs, and timber operators.

TABLE 9.—*Forest-land ownership, by subregions, 1943*

Ownership	Coal fields	Farming areas	Extensive forests	Total
Public:	*Acres*	*Acres*	*Acres*	*Acres*
Federal			34, 400	34, 400
State department of forests and waters		1, 800	126, 500	128, 300
State game commission		62, 700	169, 600	232, 300
Counties	12, 200	53, 700	39, 300	105, 200
Communities	14, 000	5, 200		19, 200
All public	26, 200	123, 400	369, 800	519, 400
Private:				
Coal companies	256, 800	3, 900	2, 100	262, 800
Water companies	17, 500	38, 900	53, 100	109, 500
Farmers	13, 200	491, 000	42, 300	546, 500
Others	88, 700	866, 600	804, 900	1, 760, 200
All private	376, 200	1, 400, 400	902, 400	2, 679, 000
Total	402, 400	1, 523, 800	1, 272, 200	3, 198, 400

Present Forest Management

Forest management varies from subregion to subregion. In the coal fields very little forest management has been applied. A few coal companies and mine-timber operators have done work in fire prevention and control, and some management for timber has been started. However, in general the forests in the coal fields are abused. Mining operations destroy much forest land, and clear-cutting of forest tracts for mine timbers is the general practice.

The forests in the farming areas receive much better management. The small holdings of the water companies and the forests owned by farmers have been spared much of the overutilization and burning to which the coal-field forests have been subjected. Many farm woodlands are managed for home use only, and the water companies have generally kept their forests uncut in order to protect their water supplies. Much of the other privately owned (nonfarm) forest land gets no management and is left to grow as it will.

In the extensive forests the smaller holdings get no management; but many of the larger forest tracts are managed for timber, recreation, or game. In the western Poconos a large area is managed for blueberry production. For the most part, lumbering in the extensive forests has been on a clear-cut basis; the result is that much of the subregion is well stocked, but the timber is too young to be of commercial value.

THE COAL FIELDS

The coal fields occupy the heart of the Anthracite Forest Region. A sparse forest, much of it sprouts and saplings, covers three-quarters of the area. Scattered through this forest are mine operations; shafts, coal breakers, huge mine waste banks piled on the surface (fig. 28), and stripped areas where the surface has been shoveled away and the coal has been removed—in some places to a depth of several hundred feet. The greater part of this subregion, with the exception of the Wyoming Valley, is unsuited to agriculture; some of it, notably in the vicinity of Hazleton, is poor even for forest land.

Into the coal fields—a space of about 190 square miles—are crowded a million people. This population is peculiarly dependent on coal mining, and its economic condition rises and falls with the anthracite industry. The decline in the population of the Anthracite Forest Region has taken place almost entirely in this subregion. It was here that the bulk

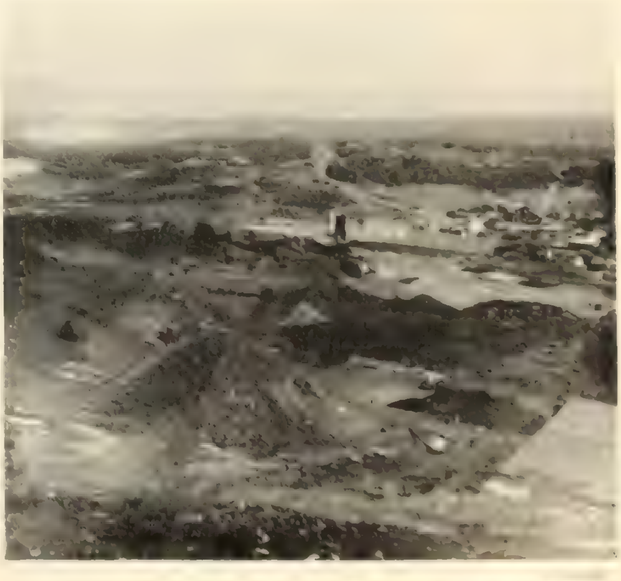


FIGURE 28.—*Mine waste banks a*[illegible]

of the unemployment was to be found in the years just prior to the war; and it is this area that will suffer most in the event of unemployment in the future.

Subdivisions

Coal occurs in four main fields. The northern coal field, which comprises the Lackawanna and Wyoming Valleys, includes the two largest cities in the region, Scranton and Wilkes-Barre. The eastern-middle field is a plateau country centering around Hazelton on the divide between the Susquehanna and Delaware watersheds. The western-middle and southern fields are a ridge-and-valley country with dense discontinuous centers of population, the largest of which are Pottsville, Shenandoah, and Shamokin. The greater part of the population is in the northern and eastern-middle fields. On the other hand, the bulk of the remaining recoverable coal is in the western-middle and southern fields.

Forest-Products Industries

Forest-products industries within the coal field area are concerned principally with the remanufacture of raw materials. (Primary manufacturing usually is found close to more ample supplies of timber than this subregion supports.) Some 30 sawmills, about half the planing mills of the Anthracite Forest Region, 20 or more small furniture plants, 15 small paper-box factories, and a number of other wood-using manufactories are located in this area. Most of the raw material for the furniture and paper-box factories is brought in from outside the region. The sawmills and in a lesser degree the planing mills and other wood-using manufactories are dependent on raw materials from within the region. Because of the depleted state of the forests, comparatively little timber cutting for any purpose is carried on within the coal-field area.

Land Ownership

The coal companies own most of the surface over the coal measures; most of the other forest land in the coal-field area is privately owned (table 10). The proportions of ownership vary somewhat from subdivision to subdivision. In the northern and eastern-middle fields, where coal mining has been carried on longest, the proportion of coal-company ownership is highest, about 70 percent. In the western-middle field it is only 53 percent. The State department of forests and waters and the State game commission, which are the principal holders of public forest land in other sections of the Anthracite Forest Region, own no land within the coal-field area.

Forest Description

The land surface above the coal measures is largely in forest (fig. 29). The rough terrain, the poor quality of the soils, and the constant threat of surface mining have discouraged most attempts at agriculture. The Wyoming Valley is an exception, but even this area is characterized more by urban communities and the wastes of mining than by agriculture.

In all, about 77 percent of the coal-field area is

TABLE 10.—*Forest-land ownership in the coal fields, by subdivisions*

Ownership	Northern field	Eastern-middle field	Western-middle field	Southern field	Total	
	Acres	*Acres*	*Acres*	*Acres*	*Acres*	*Percent*
Private:						
Coal companies	80, 600	56, 100	33, 700	86, 400	256, 800	64
Water companies	2, 200	4, 600	3, 900	6, 800	17, 500	4
Farmers	7, 200	2, 700	2, 000	1, 300	13, 200	3
Others	24, 700	13, 200	9, 200	41, 600	88, 700	22
All private	114, 700	76, 600	48, 800	136, 100	376, 200	93
Public:						
Counties	1, 800	2, 500	900	7, 000	12, 200	3
Communities	100	....	13, 300	600	14, 000	4
All public	1, 900	2, 500	14, 200	7, 600	26, 200	7
Total	116, 600	79, 100	63, 000	143, 700	402, 400	100

forested. The proportion of forest land in the subdivisions is as follows:

	Percent
Northern field	61
Eastern-middle field	82
Western-middle field	75
Southern field	93

Condition

Widespread clear-cutting for mine timbers and repeated fires have reduced the coal-field forests to a very poor condition. They contain 12 percent of the total forest area of the Anthracite Forest Region, but less than 5 percent of the area in pole-timber stands,

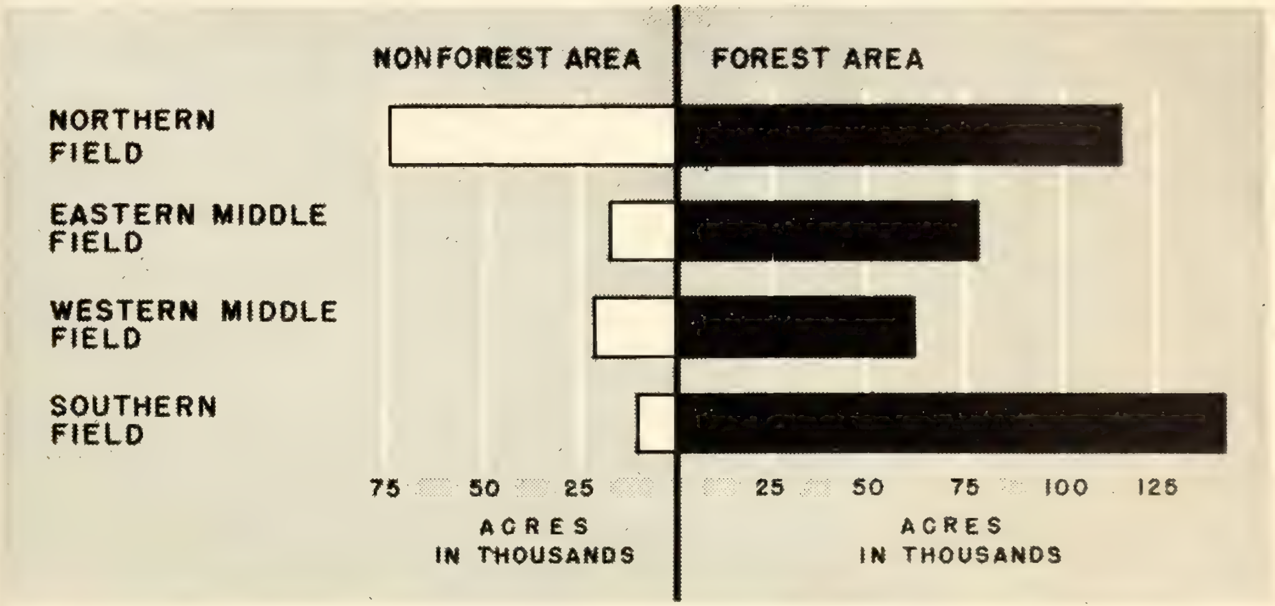


Figure 29.—*Forest area in the coal fields, by subdivisions.*

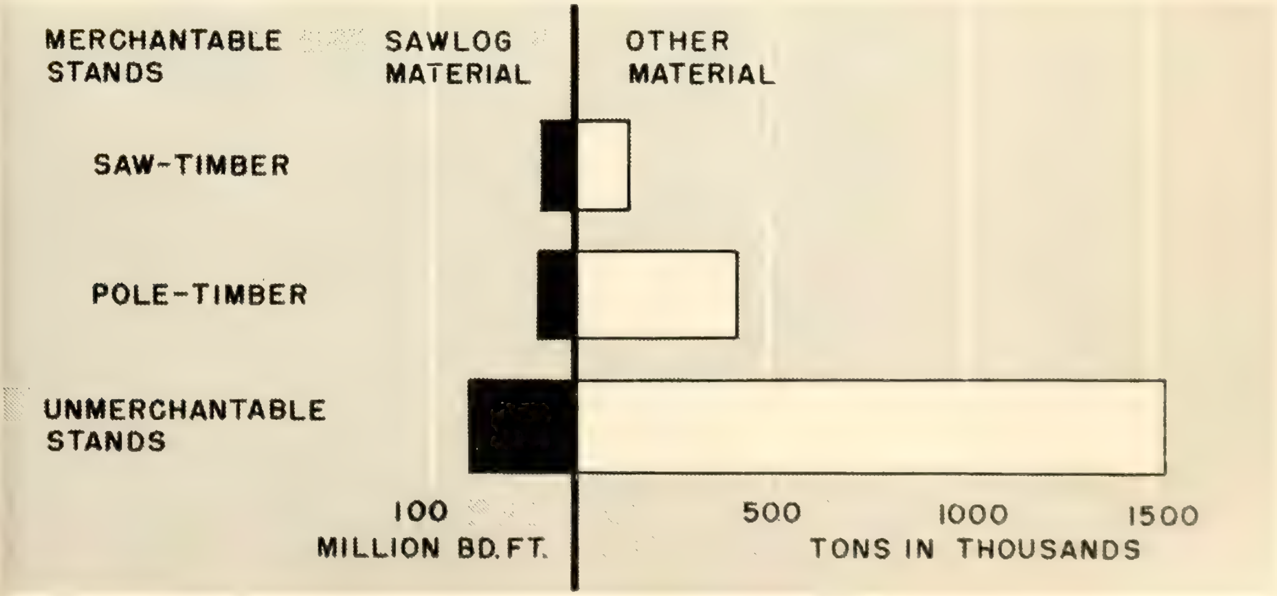


Figure 30.—*Timber volume in the coal fields, by forest condition.*

Table 11.—*Forest condition in the coal fields, by subdivisions*

Subdivision	Merchantable stands				Unmerchantable stands		Total	
	Saw timber		Pole timber					
	Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
Northern	2, 800	2	14, 600	13	99, 200	85	116, 600	100
Eastern-middle	500	1	4, 100	5	74, 500	94	79, 100	100
Western-middle	100	....	1, 200	2	61, 700	98	63, 000	100
Southern	1, 500	1	7, 500	5	134, 700	94	143, 700	100
Total	4, 900	1	27, 400	7	370, 100	92	402, 400	100

and less than 3 percent of the area in saw-timber stands. A quarter of the entire area is in useless scrub oak and is likely to remain so for many years. More than half of the saw-timber volume and three-fourths of the tonnage of smaller material is in unmerchantable stands (fig. 30).

Of the area in saw-timber stands, 58 percent is in the northern field and 30 percent in the southern (table 11). The pole-timber stands also are largely in the northern and southern fields.

Types and Species

Oaks are the dominant species in the forests of the coal fields (table 12). Chestnut oak is found chiefly along the ridges of the western-middle and southern fields. Scrub oak is present throughout the region; it occupies nearly half the forest area in the eastern-middle field, but there is relatively little in the northern field.

Other hardwoods and some conifers also are found in the coal fields. About a fifth of the northern field area is in the maple-beech-birch type. There are about 47,000 acres of white pine-oak in the southern field, though the percentage of pine is low. White pine-hemlock type forests are found in the northern and eastern-middle fields.

Oaks also predominate in the saw-timber stands. Red, white, and chestnut oaks make up most of the volume, but black, scarlet, and pin oaks are also found. The other hardwoods are chiefly red maple, with some beech and black birch; the conifers are white pine and hemlock. The estimated volume is:

	M board feet
Oaks [1]	11, 940
Other hardwoods	4, 990
Conifers	3, 880
All species	20, 810

[1] A small amount of sugar maple is included with the oaks.

Table 12.—*Forest areas and volumes in the coal fields, by major forest types*

Forest type	Forest area		Sawlog material		Other material	
	Acres	*Percent*	*1,000 bd. ft.*	*Percent*	*Tons*	*Percent*
Sugar maple-beech-yellow birch	21, 000	5	11, 700	11	129, 700	8
Aspen-gray birch-pin cherry	6, 800	2	200	(1)	40, 500	2
White pine-hemlock	2, 900	1	2, 700	2	28, 600	2
White pine-white oak-red oak	49, 900	12	20, 900	18	255, 900	15
Red oak-black oak-white oak	181, 300	45	70, 200	60	1, 028, 200	60
Chestnut oak	41, 500	10	9, 500	8	177, 900	10
Scrub oak	99, 000	25	1, 400	1	44, 300	3
Total	402, 400	100	116, 600	100	1, 705, 100	100

[1] Negligible.

A similar preponderance of oaks is to be seen in the total volume of merchantable pole-timber stands:

	Tons
Oaks	286, 200
Other hardwoods	74, 100
Conifers	53, 800
All species	414, 100

Young growth of commercially valuable species occupies about 225,000 acres, or 56 percent of the forest land of the coal-field area. Good management can develop these to the point where they could contribute considerably to the timber needs of the mining industry. Since much of the forest is owned by the coal companies themselves, such development would materially lessen the companies' expenditures for timber.

Growth and Drain

Because of past fires and heavy cutting by mine-timber operators, there are few operable stands today in the coal-field area. Proximity of the forests to the mines has resulted in stands being clear-cut for mine timbers as soon as they attained sufficient volume to justify operation. The fact that total growth exceeds drain (table 13) is of little significance because excess growth is limited largely to small, scattered stands, parks, or areas reserved for residential development.

TABLE 13.—*Inventory change in the coal fields, by condition class and kind of material, Jan. 1, 1943, to Jan. 1, 1944*

SAWLOG MATERIAL

Condition class	1943 inventory	Total drain	Net increment	1944 inventory
Merchantable stands:	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*
Saw timber	20, 800	1, 000	1, 510	21, 310
Pole timber	23, 000	930	4, 070	26, 140
Unmerchantable stands	72, 800	1, 010	1, 740	73, 530
Total	116, 600	2, 940	7, 320	120, 980

OTHER MATERIAL

Condition class	1943 inventory	Total drain	Net increment	1944 inventory
Merchantable stands:	*Tons*	*Tons*	*Tons*	*Tons*
Saw timber	87, 000	2, 600	6, 600	91, 000
Pole timber	315, 900	7, 700	35, 400	343, 600
Unmerchantable stands	1, 302, 200	62, 700	82, 600	1, 322, 100
Total	1, 705, 100	73, 000	124, 600	1, 756, 700

Although the forest area of the coal fields comprises more than 12 percent of the region's forests, the growth of all material in trees 5.0 inches and larger amounted in 1943 to only 7 percent, and that of the saw timber alone to only about 5 percent of the growth in the entire region. Only 7 percent of the round timbers needed by the mines came from this area, and less than 5 percent of the sawed products.

Potentialities

The forest situation in the coal fields is unfavorable both from the owners' and the community's standpoint. The forest land of the coal-field area is too small ever to provide all the wood required by the mines. But coal-field landowners could build up their forests to provide a considerably larger proportion of their mine-timber needs. This could be accomplished without decreasing the 1943 drain rate but it would require planned operations in accordance with forest-management principles. Under such a plan the drain could average the 1943 rate for the next 20 years and still permit total growing stock to build up to twice its present volume. Ultimately, say in 100 years, under management for quality as well as quantity production, the forests of this area could contain many times their present growing stock volume, with possibilities of yielding 10 times as much saw timber annually as at present. Two-thirds of the forest area of the coal fields is in potentially productive forest types. These forests can some day support local industries turning out finished products of high value and providing employment to large numbers of skilled laborers.

Coal and people are virtually the only resources of the coal fields. On the other hand, the rehabilitation measures required to bring the forests back to productivity would provide considerable employment for 5 or 10 years. The total forest acreage is too small, however, for it to be able to solve more than a comparatively small proportion of the economic problems of the subregion. Effective readjustment of its economic condition must therefore take into account the economic possibilities of the other subregions.

North, west, and south of the coal fields lie the farming areas. Here cropland and pasture are interspersed with woodland. Along the ridges and steeper slopes, where thin soils have discouraged agriculture, are more extensive forest tracts (fig. 31). In contrast to the sparsely stocked forest land of the coal fields, much of the woodland in the farming area is in good condition. Small amounts of virgin timber and much well stocked second growth are to be found here.

The flat country of Dauphin and Lebanon Counties and many of the valleys in the central part of the region contains high-grade farm land. Here general farming predominates. The bulk of the farm income is derived from grain, poultry, eggs, livestock, and in a lesser degree from vegetables. In the northern counties, where the land is not so well suited to crops, the emphasis is on dairy farming. Timber also is an important source of income in these counties.

Industrial towns in the north are few and small, and the population is almost entirely rural. Farther south, industry is more important, and the greater proportion of the population is urban. Metal and textile manufacture predominate. Most of the industrial population is located along the Susquehanna River, with the heaviest concentration in the neighborhood of Harrisburg. There are also industrial centers in Lebanon County and in the Blue Mountain Valley.

Unemployment has at no time been a really serious problem in the farming areas, and is not likely to become so in the future. On the other hand, to how great a degree the farming areas can help solve the problem in the coal fields is not certain. Agriculture is about as highly developed as the quality of the land and the size of the available markets warrant. Further industrial development, however, is possible. And the large acreage in forest land indicates that development of the forests in this area could contribute to the economic stabilization of the region.

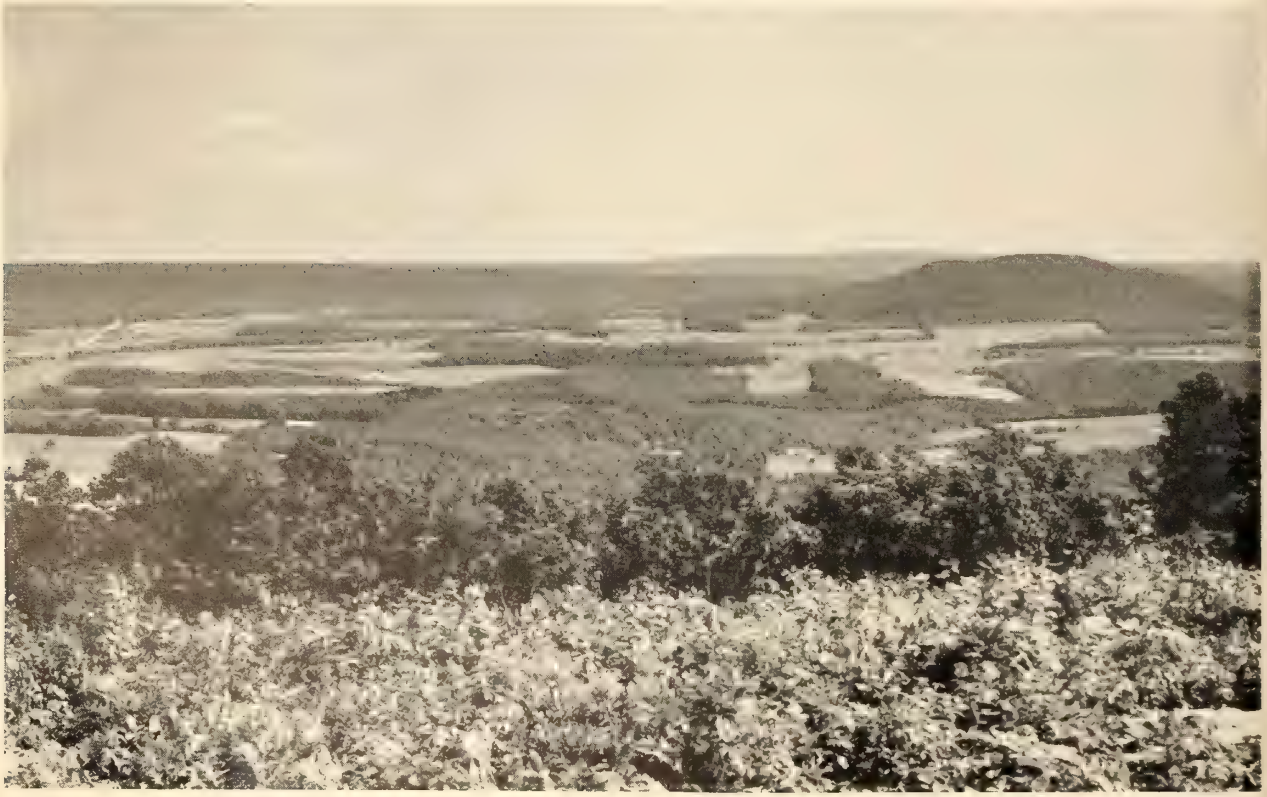

F—447495

Figure 31.—*The farming area includes forested ridges adjacent to the agricultural valleys.*

Subdivisions

Like the coal fields, the farming area has four subdivisions. The largest of these is the northern dairy subdivision, which lies mostly on the eastern extremity of the Allegheny Plateau. The other subdivisions—the Susquehanna Valley, the Blue Mountain Valley, and the Dauphin-Lebanon area—are in the foothills and valleys. Some of the farm land in the Susquehanna Valley and Dauphin-Lebanon subdivisions is as good as any in the State.

Forest-Products Industries

Every forest-product industry within the Anthracite Forest Region is represented in the farming area. All the maple-syrup manufacture and a high proportion of the fuel-wood and fence-post production are carried on here. A considerable amount of mine-timber and sawlog production also takes place in this area, including most of the small-scale operations. About two-thirds of the sawmills and about half of the planing mills of the region operate here. The larger furniture and paper factories and many of the other wood-using manufacturing plants are located in farming-area towns. Some 65 residents of the area are engaged on a full-time basis in forest management. Except for the furniture and paper-box manufacture, the forest-products industries of the farming area are largely dependent on the local forests. Many of the requirements even of these industries could be met locally if the forests were fully productive.

Land Ownership

A large proportion of the forest land in the farming area is not owned by farmers (table 14). A small amount belongs to coal and water companies, a large amount to other private owners. Some is owned by large private estates, hunting and fishing clubs, and commercial timber operators. Other tracts are in the hands of banks and insurance companies that have acquired them through mortgage foreclosures, and some tracts are being held for real-estate development.

The farming area also includes a small amount of publicly owned forest land. Nearly half of this is owned by counties and communities and is scattered in small tracts. A small tract in Wyoming County is under the supervision of the State department of forests and waters. The other public forests, most of them in Wayne, Susquehanna, and Columbia Counties, belong to the State game commission.

The ownership distribution within the subdivisions is in approximately the same proportions as in the farming area as a whole. Certain variations occur, however, largely in the distribution of public ownership and in the proportion in farm woodlands. Much of the forest land in the "other" private ownership lies along the ridges that run through or

TABLE 14.—*Forest-land ownership in the farming area, by subdivisions*

Ownership	Northern dairy	Susquehanna Valley	Dauphin-Lebanon	Blue Mountain Valley	Total	
	Acres	*Acres*	*Acres*	*Acres*	*Acres*	*Per*
Private:						
Coal companies	3, 400	500			3, 900	(1)
Water companies	7, 400	16, 000	6, 500	9, 000	38, 900	3
Farmers	275, 900	109, 100	34, 700	71, 300	491, 000	32
Others	451, 200	197, 200	42, 200	176, 000	866, 600	57
All private	737, 900	322, 800	83, 400	256, 300	1, 400, 400	92
Public:						
State forests	1, 800				1, 800	
Game commission	22, 000	23, 900	3, 000	13, 800	62, 700	4
Counties	20, 200	19, 200	600	13, 700	53, 700	
Communities			4, 300	900	5, 200	
All public	44, 000	43, 100	7, 900	28, 400	123, 400	8
Total	781, 900	365, 900	91, 300	284, 700	1, 523, 800	

[1] Negligible.

adjacent to farming sections. Forest land in public ownership is generally located along the steeper slopes and the less productive ridges.

Forest Description

Most of the farms in the northern dairy and Blue Mountain Valley subdivisions are partly in forest (fig. 32). In contrast to these, the two other subdivisions include many farms that have no appreciable woodland area. In the north there are a few areas (higher in elevation than the surrounding country) that contain several thousand acres of forest. In the south numerous forested ridges that run through or adjacent to farming sections have been included in the Susquehanna and Blue Mountain Valley subdivisions. The Dauphin-Lebanon subdivision, which is least forested, embraces the Cornwall Hills.

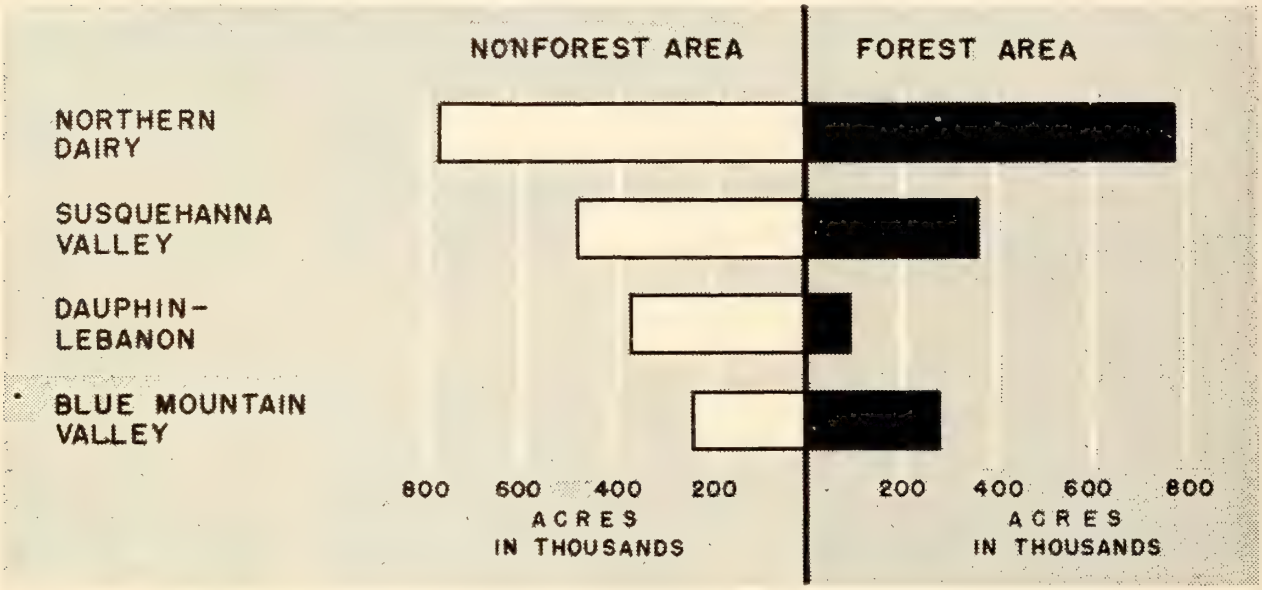


FIGURE 32.—*Forest in the farming area, by subdivisions.*

About 46 percent of the farming area is in forest. The proportion of forest land in each of the farming area subdivisions is:

	Percent
Northern dairy	50
Susquehanna Valley	43
Dauphin-Lebanon	20
Blue Mountain Valley	55

Condition

The forests of the farming areas are in much better condition than those in the coal fields, or even than those in the extensive forests. Though they comprise but 48 percent of the total forest area of the Anthracite Forest Region they include 56 percent of the area in pole-timber stands and 62 percent of the area in saw-timber stands. All together, they contain about 60 percent of the saw timber and 57 percent of the total timber volume in the Anthracite Forest Region (fig. 33).

The northern dairy and Dauphin-Lebanon subdivisions are farthest removed from the mines and have the largest proportion of their forest land in farm woodlands. They are also in the best condition. A large percentage of the merchantable acreage is in the northern dairy subdivisions where 74 percent of the saw-timber and 72 percent of the pole-timber stands are located. The condition of the Dauphin-Lebanon forests is as good, but the acreage is much less. The other subdivisions (table 15) are potentially as good as any, but need well planned management to bring them to full productivity.

TABLE 15.—*Forest condition in the farming area, by subdivisions*

Subdivision	Merchantable stands				Unmerchantable stands		Total	
	Saw timber		Pole timber					
	Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
Northern dairy	81, 400	10	247, 400	32	453, 100	58	781, 900	100
Susquehanna Valley	16, 600	4	53, 500	15	295, 800	81	365, 900	100
Dauphin-Lebanon	4, 900	5	17, 300	19	69, 100	76	91, 300	100
Blue Mountain Valley	7, 700	3	24, 100	8	252, 900	89	284, 700	100
Total	110, 600	7	342, 300	22	1, 070, 900	71	1, 523, 800	100

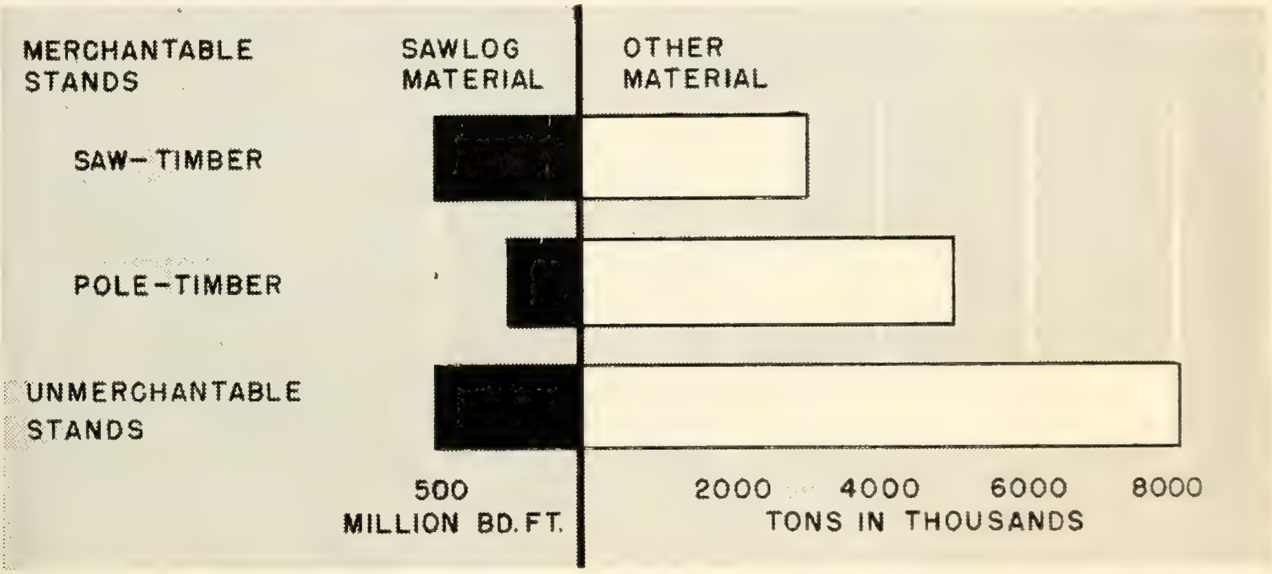


FIGURE 33.—*Timber volume in the farming area, by forest condition.*

Types and Species

Forest types vary among the subdivisions (table 16). In the northern dairy subdivision 70 percent of the area is in the valuable maple-beech-birch type; the rest of the area is divided about evenly among the other three important types. In the Susquehanna Valley more than half the area is in the white pine-oak type, and more than a third in the red oak-black oak-white oak types; only 4 percent is in white pine-hemlock and 6 percent in chestnut oak. The Blue Mountain Valley has a similar type distribution except that the proportions of white pine-hemlock and white pine-oak are larger. In the Dauphin-Lebanon subdivision 75 percent of the area is in the red oak-black oak-white oak type and 20 percent in the white pine-oak type. The minor types are found chiefly in the southern subdivisions. The most important of these are Virginia pine in Northumberland County and the river birch-sycamore type along the banks of rivers.

Of the individual species, hemlock and white pine are the principal conifers, with pitch pine important in the southern sections. In the northern dairy subdivision hard maple predominates over the oaks, though there is some white, red, and chestnut oak; other principal species are beech and yellow birch. In the southern sections white and red oak predominate (black oak is an important species in Dauphin-Lebanon) and hickory and scarlet, chestnut, and pin oak are found in small quantities; other major species are black birch and yellow-poplar. Red maple and white ash are important throughout the area. Basswood and elm occur throughout as secondary species. Other secondary species are black cherry in the north; and walnut, black locust, sycamore, willow, and black gum in the south.

TABLE 16.—*Forest areas and volume in the farming area, by major forest types*

Forest type	Forest area		Sawlog material		Other material	
	Acres	*Percent*	*M bd. ft.*	*Percent*	*Tons*	*Percent*
Sugar maple-beech-yellow birch	538, 900	35	538, 700	43	5, 909, 600	44
Aspen-gray birch-pin cherry	3, 600	(1)	200	(1)	24, 400	(1)
White pine-hemlock	126, 100	8	227, 800	18	1, 150, 700	9
White pine-white oak-red oak	452, 700	30	282, 200	22	3, 315, 000	25
Red oak-black oak-white oak	348, 500	23	207, 800	16	2, 813, 700	21
Chestnut oak	40, 600	3	10, 300	1	199, 500	1
Scrub oak	6, 600	(1)	100	(1)	3, 900	(1)
Total	1, 523, 800	100	1, 272, 700	100	13, 478, 400	100

[1] Negligible.

Hardwoods other than oaks and hard maple predominate in both saw-timber and pole-timber stands. In the saw-timber stands the estimated volumes are:

	M board feet
Conifers	166,200
Oaks and hard maple	122,800
Other hardwoods	229,900
All species	518,900

In pole-timber stands the relative volumes are:

	Tons
Conifers	588,800
Oak and hard maple	2,104,700
Other hardwoods	2, 775, 800
All species	5,469,300

The species in the pole-timber stands are much the same as the species in the saw-timber stands, and have a similar geographical distribution.

Although it comprises less than a third of the total forest land in the farming area, the forest land owned by farmers is by far the most important economically. These woodlands fill the farmers' timber needs. They provide a source of income when timber is sold for stumpage. They provide a considerably larger income when the farmers do their own logging and thus save the labor costs on the operation.

These farm woodlands vary in size from 2 to 3 acres to several hundred. Usually they form an integral part of the farm though they are sometimes independent plots of land at some distance from the rest of the farmer's property. A few of these farm woodlands are stands of virgin timber, uncut remnants of the original forest cover; but most are second- or even third-growth stands. Many are used for grazing, and the reproduction is poor (fig. 34). Some have been only partially cut over, and now support trees of varying ages; many others have been clearcut, and even-aged stands of all ages are to be found throughout the area. Fire is infrequent in these woodlands, and they have suffered little damage from fire.

Growth and Drain

Because the forests of the farming area are in much better condition than those in the coal fields, they have been subjected to heavier cutting during the recent war years. This has been especially true of the saw-timber stands, which have been seriously overcut. In 1943 the saw-timber drain on these stands was a third larger than the growth (table 17). On the other hand, the unmerchantable stands are growing up into the pole-timber classification faster than merchantable stands are reverting to unmerchantable status through cutting, and the pole-timber stands themselves show an excess of growth over drain. As a result of this increase in volume in the pole-timber stands, the total timber volume in the area is increasing.

What are the prospects for the next 10 to 20 years? It is doubtful if the drain on the saw-timber stands of this area will continue at the 1943 level during this period. Stands that were allowed to develop unhampered for decades with only the occasional removal of material to meet farm needs were cut during the war. The larger trees with high-quality sawlogs were sought during the war and cut at a rate far exceeding that of replacement. Smaller sawlog material will gradually become more plentiful as the younger stands grow into saw-timber size, but it is doubtful if they will be desired to any great extent by the markets of the next two decades. The prospects are, therefore, that the stands of the farming area will contain considerably more volume of sawlog material 20 years hence and that smaller material will also be plentiful.

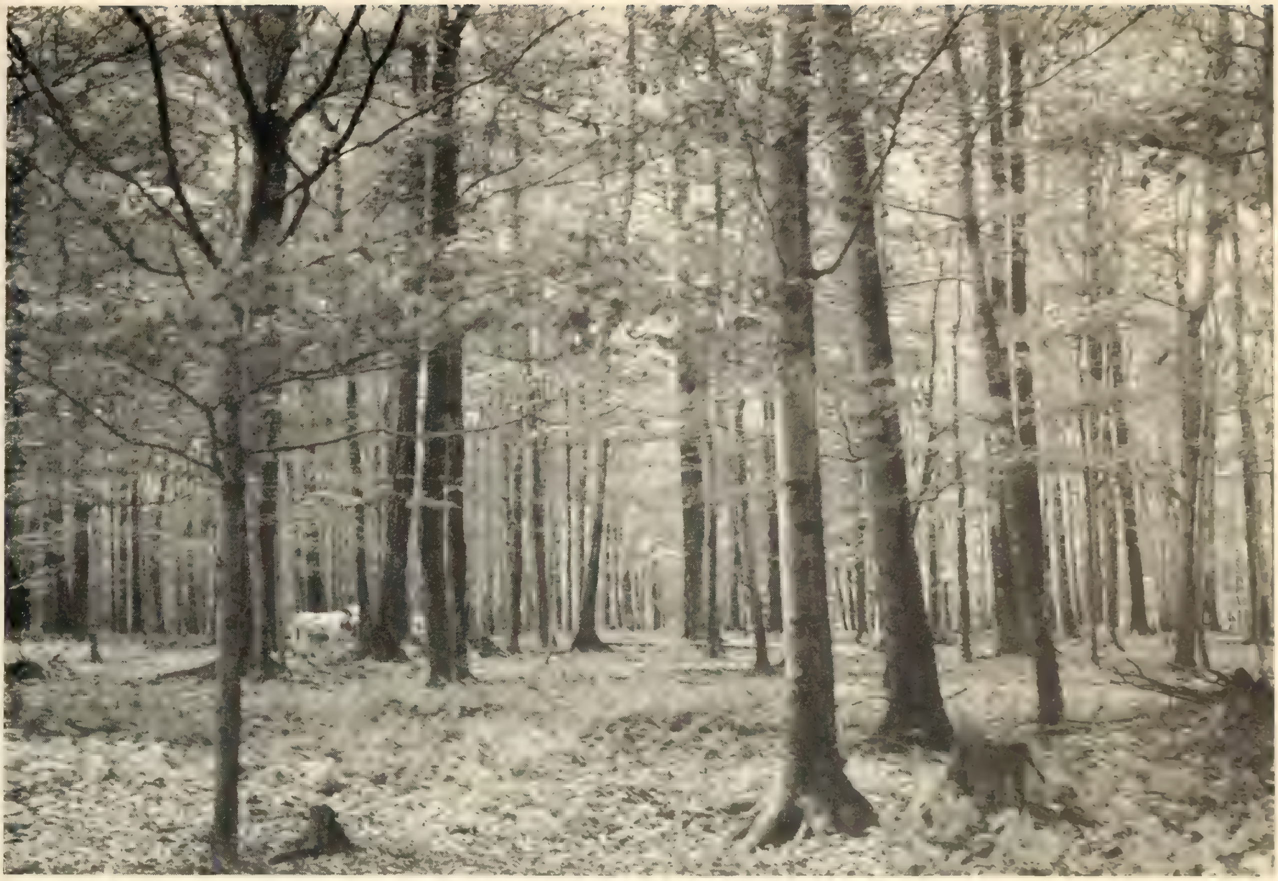


FIGURE 34.—*Many farm woodlands are used for grazing, and reproduction is poor.*

TABLE 17.—*Inventory change in the farming area, by condition class and kind of material, Jan. 1, 1943 to Jan. 1, 1944*

SAWLOG MATERIAL

Condition class	1943 inventory	Total drain	Net increment	1944 inventory
Merchantable stands:	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*
Saw timber	518, 900	48, 540	31, 360	501, 720
Pole timber	238, 200	31, 290	64, 050	270, 960
Unmerchantable stands	515, 600	9, 650	19, 250	486, 700
Total	1, 272, 700	89, 480	76, 160	1, 259, 380

OTHER MATERIAL

Condition class	1943 inventory	Total drain	Net increment	1944 inventory
Merchantable stands:	*Tons*	*Tons*	*Tons*	*Tons*
Saw timber	1, 973, 300	72, 200	75, 500	1, 976, 600
Pole timber	4, 324, 700	171, 500	625, 200	4, 778, [illegible]
Unmerchantable stands	7, 180, 400	96, 400	192, 100	[illegible]
Total	13, 478, 400	340, 100	892, 800	[illegible]

Potentialities

What are the potentialities of the farming-area forests? Nearly three-fourths of the forest area is in the productive maple-beech-birch, the white pine-hemlock, and the white pine-white oak forest types. These stands are relatively secure from devastating forest fires except in cut-over areas where heavy slash has been left lying. The maple-beech-birch type is well adapted to a selection system of management that will yield a large volume of high-quality material continuously. The other two types may have to be managed on a group-selection basis in order to assure reproduction of white pine. All three types will attain a rate of growth exceeding 250 board feet per acre a year on a rotation of about 90 years—4½ times the present rate. In fact, under good management, the entire forest area of the farming subregion could exceed this rate of growth. Under such circumstances the forests could produce about 400,000,000 board feet annually as compared to less than 90,000,000 now. Such production would attract forest-products industries requiring high-quality sugar maple, white ash, black cherry, and white pine; and the income and employment of the subregion would be greatly increased.

THE EXTENSIVE FORESTS

East of the coal-field area and in two smaller blocks to the west are extensive tracts of forest land (fig. 35). These tracts are largely on high land, much of it entirely unsuited to agriculture and too remote from industrial centers for either industrial or suburban development. In the Pocono highlands to the east, and to some extent in the North Mountain area in the northwest, are summer and winter resorts and other recreational developments. In Pike, Sullivan, and central Dauphin Counties commercial

F-447497

FIGURE 35—*The extensive forests of the highlands.*

timber operations are carried on; and the game supply in these areas is sufficient to attract many hunters during the hunting season. Through western Monroe, eastern Luzerne, and southern Lackawanna Counties, however, there is little settlement; and a large proportion of the forest land is too depleted at present for anything but blueberry and game production. There are, however, some recreational developments in this section.

The number of people in the extensive forests is so small that their employment is no serious problem. On the contrary, development of the forest resources here may be of considerable importance in providing employment for people from the coal fields.

Subdivisions

The extensive forest consists of four subdivisions: the eastern Poconos, the western Poconos, North Mountain, and Peters Mountain. The eastern Poconos lie on the eastern extremity of the Allegheny Plateau, about 2,000 feet above sea level; it is an uneven, wooded tableland pocketed with small glacier-formed lakes and spruce swamps. Parts of the area are served by an excellent system of roads; other parts, particularly in the southwest, are almost inaccessible. Considerable lumbering is carried on in this area; and the altitude, the lakes, and the forests make the area a popular vacation resort.

The western Poconos are slightly higher in elevation, and in some places mountains rise above the plateau. Much of this area has at one time or another been burned over, and in western Monroe County is a large area devoted to the production of blueberries where forest growth is deliberately kept down by fire.

The North Mountain subdivision, also on the Allegheny Plateau, is more mountainous than any part of the Pocono area; it rises in places to over 2,500 feet. A considerable amount of lumbering is carried on in this area, much of it for the sawmill market in Williamsport. The forested mountains and lakes of this area also attract visitors in the summer.

The Peters Mountain subdivision is located on a part of the Appalachian chain and is considerably lower in elevation than the other subdivisions. It consists of a series of ridges and valleys lying northeast-southwest, much of it inaccessible by road. At present little lumbering is being done; but its comparative nearness to Harrisburg and other industrial centers makes it a popular hunting ground.

Forest-Products Industries

The forest-products industries of the extensive forest area are principally mine-timber production and lumbering. About 65 sawmills operate in this area, and there are several planing mills either within the area or on its outskirts. In addition about 40 persons are engaged in operating the State and Federal lands or otherwise occupied with forest management.

Land Ownership

The proportion of publicly owned forest land is approximately four times as great in the extensive forests as it is in the rest of the Anthracite Forest Region (table 18). These public forests are very un-

TABLE 18.—*Forest-land ownership in the extensive forests, by subdivisions*

Ownership	Eastern Poconos	Western Poconos	North Mountain	Peters Mountain	Total	
	Acres	*Acres*	*Acres*	*Acres*	*Acres*	*Percent*
Private:						
Coal companies	....	1, 500	400	200	2, 100	(1)
Water companies	500	43, 200	400	9, 000	53, 100	4
Farmers	23, 400	10, 700	6, 700	1, 500	42, 300	3
Others	290, 200	304, 800	160, 800	49, 100	804, 900	64
All private	314, 100	360, 200	168, 300	59, 800	902, 400	71
Public:						
State forests	....	34, 400	....	....	34, 400	3
Game commission	66, 200	5, 900	41, 200	13, 200	126, 500	10
Counties	8, 000	45, 500	75, 900	40, 200	169, 600	[illegible]
Communities	3, 000	22, 600	9, 000	4, 700	39, 300	[illegible]
All public	77, 200	108, 400	126, 100	58, 100	369, 800	[illegible]
Total	391, 300	468, 600	294, 400	117, 900	1, 272, 2[illegible]	[illegible]

---

[1] Negligible.

evenly distributed among the subdivisions. In the eastern Poconos they constitute less than 20 percent of the area, and in the western Poconos less than a quarter. In the North Mountain subdivision, on the other hand, 43 percent of the area is publicly owned and in the Peters Mountain subdivision nearly 50 percent. The water companies also own an appreciable proportion of the forest land in the western Poconos and the Peters Mountain subdivision, and farmers hold about 6 percent of the total area in the eastern Poconos.

Forest Description

The original forests of the Anthracite Forest Region contained much timber of unusually high quality. The white pine and pitch pine in the Poconos were especially sought after. Early travelers spoke of the standing timber with something akin to awe. In the North Mountain subdivision large valuable sugar maple, black cherry, and white ash timber was found; and though there is now some poor forest of aspen, gray birch, and pin cherry in these sections, this is largely because of fire. These forests can be restored.

The subdivisions of the extensive forest area are 93 percent in forest (fig. 36). The proportion of forest land in each subdivision is:

	Percent
Eastern Poconos	93
Western Poconos	95
North Mountain	92
Peters Mountain	91

Condition

The condition of the extensive forest as a whole is considerably better than that of the coal fields and not quite as good as that of the farming area (fig. 37).

The forest condition varies greatly from subdivision to subdivision (table 19). The North Mountain area

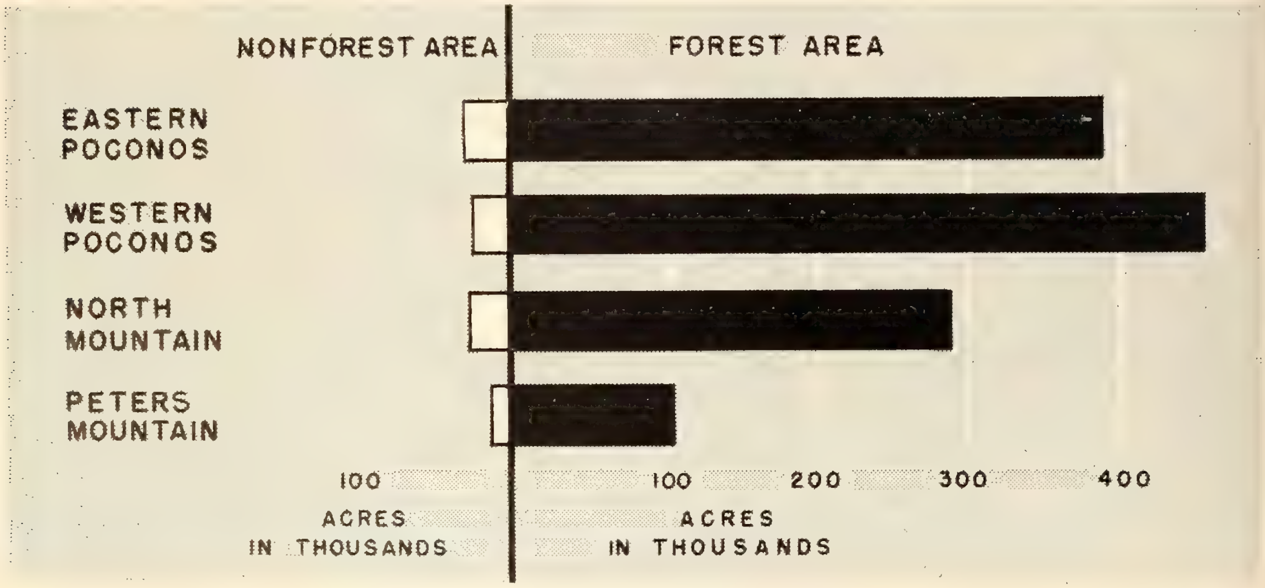


FIGURE 36.—*Forest area in the extensive forest area, by subdivisions.*

TABLE 19.—*Forest condition in the extensive forest area, by subdivisions*

Subdivision	Merchantable stands				Unmerchantable stands		Total	
	Saw timber		Pole timber					
	Acres	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*	*Acres*	*Percent*
Eastern Poconos	4, 200	1	36, 200	9	350, 900	90	391, 300	100
Western Poconos	12, 300	3	57, 600	12	398, 700	85	468, 600	100
North Mountain	36, 800	12	122, 300	42	135, 300	46	294, 400	100
Peters Mountain	8, 600	7	28, 700	24	80, 600	68	117, 900	100
Total	61, 900	5	244, 800	19	965, 500	76	1, 272, 200	100

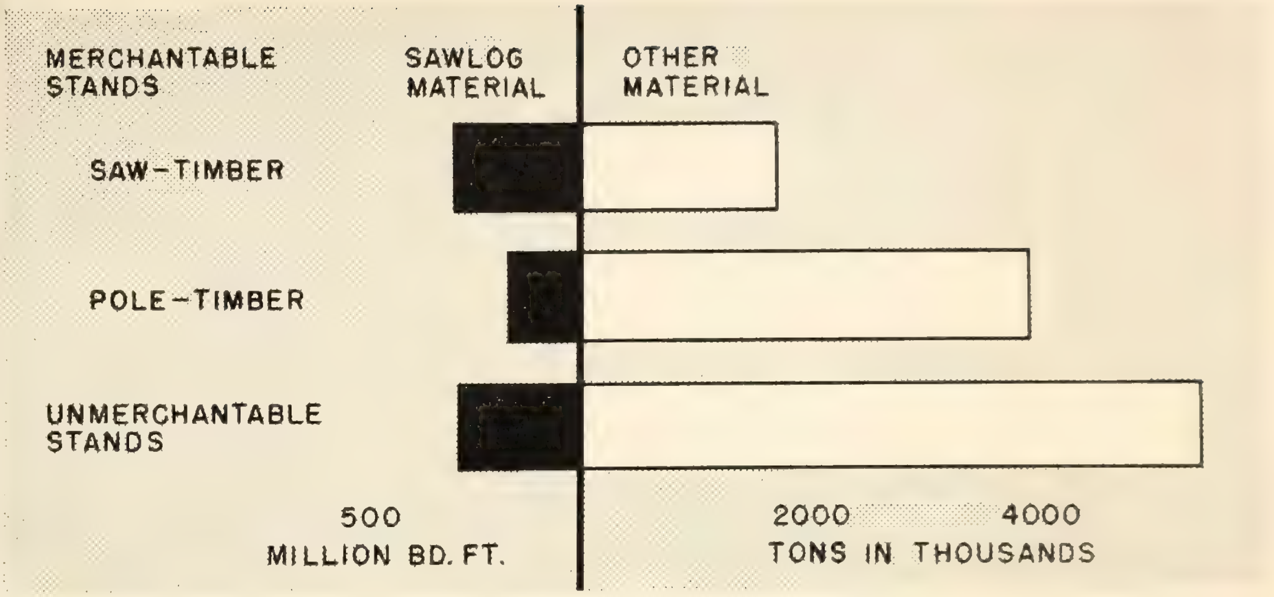


FIGURE 37.—*Timber volume in the extensive forest area, by forest condition.*

is in much better condition in this respect than any other part of the subregion. The eastern Pocono subdivision has the largest proportion of its acreage in unmerchantable areas at present; but most of these are well stocked with fast-growing young trees of commercial species. On the other hand, a considerable acreage in the western Poconos is in scrub oak and is used for blueberry production. The Peters Mountain subdivision, though in poorer shape than the North Mountain, is in better condition than the Poconos. With the exception of parts of the western Pocono subdivision, which have been covered with scrub oak as long as white man has known them, these extensive forests are all potentially productive.

Types and Species

The beech-birch-maple type dominates the extensive forests in the north, and the various oak types in the east and south (table 20). The beech-birch-maple type is chiefly to be found in the North Mountain subdivision, where it occupies 58 percent of the area, and in the northwest section of the western Poconos. Virtually all the aspen type is in burned-over tracts that are normally covered with the beech-birch-maple type; it occupies 21 percent of the area in the North Mountain subdivision. The red oak-black oak-white oak type occupies somewhat more than half the area in the eastern Poconos and in the Peters Mountain subdivision; there is a sizable

TABLE 20.—*Forest area and volumes in the extensive forest area, by major forest types*

Forest type	Forest area		Sawlog material		Other material	
	Acres	*Percent*	*M bd. ft.*	*Percent*	*Tons*	*Pe[illegible]*
Sugar maple-beech-yellow birch	362,800	28	316,800	43	3,286,500	37
Aspen-gray birch-pin cherry	87,700	7	4,000	1	557,100	[illegible]
White pine-hemlock	117,500	9	155,500	21	1,475,600	[illegible]
White pine-white oak-red oak	152,700	12	77,100	10	860,600	[illegible]
Red oak-black oak-white oak	385,400	30	170,500	23	2,397,300	[illegible]
Chestnut oak	33,700	3	17,400	2	195,600	[illegible]
Scrub oak	125,900	10	2,500	(1)	78,800	[illegible]
Other types	6,500	1	2,500	(1)	53,[illegible]	[illegible]
Total	1,272,200	100	746,300	100	8,[illegible]	[illegible]

[1] Negligible.

amount in the western Poconos also. White pine-hemlock is to be found in ravines and other relatively inaccessible places throughout the area. The white pine-oak type is found chiefly in the Poconos, especially in the eastern Poconos where it occupies a quarter of the area. The chestnut oak is almost entirely in the Peters Mountain subdivision, whereas the scrub oak is mostly in the southwestern portion of the western Poconos. The most important minor type is red spruce, most of which is to be found in the Poconos.

Of the species, the chief conifers are white pine, hemlock, and in the south, pitch pine. Hard maple occurs in the north, where it is more important than the oaks. In the south the principal species in this group are white, red, and black oaks, with an admixture of the other oak species and some hickory. The dominant species in the other hardwood group are red maple, beech, white ash, and yellow birch in the north; and red maple, black birch, white ash, and yellow-poplar in the south.

Hardwoods other than oaks and hard maple are the dominant species in the extensive forests. In saw-timber stands the conifers also are more important than the oaks:

	M board feet
Conifers	96, 200
Oaks and hard maple	72, 200
Other hardwoods	129, 900
All species	298, 300

In the pole-timber stands the oaks and hard maple are more important than the conifers. The distribution by species groups of the total merchantable volume in these stands is:

	Tons
Conifers	302, 700
Oaks and hard maple	1, 528, 400
Other hardwoods	2, 089, 300
All species	3, 920, 400

Growth and Drain

The saw-timber stands in the extensive forest area, like those in the farming area, were subjected to heavy cutting during the war period. Many of these stands have only recently attained sufficient volume to justify operation, the virgin timber having been removed 40 to 60 years ago. Most of the forest is still in young stands. Although the drain on saw-timber stands in 1943 was more than one-third larger than the growth, the pole-timber stands actually increased in volume, largely because of the movement of unmerchantable stands into the pole-timber classification (table 21).

What are the prospects for the next 10 to 20 years? The pressure of growth in the young forests of the extensive forest area will result in larger growing-stock volumes of both sawlog and other materials even if drain should be continued at its current level. The larger sizes in the extensive forests are being overcut, but the prospects for high-quality material in the future are good.

TABLE 21.—*Inventory change in the extensive forest area, by condition class and kind of material, Jan. 1, 1943, to Jan. 1, 1944*

SAWLOG MATERIAL

Condition class	1943 inventory	Total drain	Net increment	1944 inventory
	M bd. ft.	*M. bd. ft.*	*M bd. ft.*	*M bd. ft.*
Merchantable stands:				
Saw timber	298, 300	29, 990	18, 700	287, 010
Pole timber	164, 600	21, 610	29, 530	172, 520
Unmerchantable stands	283, 400	3, 670	—2, 820	276, 910
Total	746, 300	55, 270	45, 410	736, 440
OTHER MATERIAL				
	Tons	*Tons*	*Tons*	*Tons*
Merchantable stands:				
Saw timber	1, 076, 700	23, 600	47, 000	1, 100, 100
Pole timber	3, 074, 700	88, 300	277, 900	3, 264, 300
Unmerchantable stands	4, 753, 300	91, 400	229, 400	4, 891, 300
Total	8, 904, 700	203, 300	554, 300	9, 255, 700

Potentialities

What are the potentialities of the extensive forests? The productive forest types of the region (maple-beech-birch, white pine-hemlock, and white pine-white oak) cover half of the extensive forest area. These forests, and those of the oak types, are today producing larger cubic-foot volume growth per acre than either of the other principal land use areas.

This is due largely to well stocked young stands. The current growth of saw timber is somewhat less than that of the farming-area forest, but its potentialities are nearly as great. Growth under an 80- to 90-year rotation on a 10-year cutting cycle should amount to about 240 board feet per acre per year as compared with the present 42. This potential yield of the extensive forests would maintain forest-products industries employing from 6 to 10 times the present number of employees and greatly enhance the income of the subregion.

REFERENCES

(1) ALLEGHENY FOREST EXPERIMENT STATION.
1940. SURVEY OF FOREST EMPLOYMENT POSSIBILITIES IN THE ANTHRACITE REGION OF PENNSYLVANIA. Allegheny Forest Expt. Sta. Anthracite Survey Paper 1. 7 pp. [Processed.]

(2) ———
1940. INTENSIFIED PROTECTION OF WYOMING VALLEY FORESTS AGAINST FIRE THROUGH USE OF COMMUNITY LABOR. Allegheny Forest Expt. Sta. Anthracite Survey Paper 2. 12 pp., illus. [Processed.]

(3) FORBES, R. D., and BECK, C. W.
1941. TAX DELINQUENCY OF FOREST LANDS IN THE ANTHRACITE FOREST REGION OF PENNSYLVANIA. Allegheny Forest Expt. Sta. Anthracite Survey Paper 3. 16 pp. [Processed.]

(4) ——— and MESAVAGE, CLEMENT.
1943. THE FORESTS OF LUZERNE COUNTY, PENNSYLVANIA, IN RELATION TO EMPLOYMENT AND WELFARE. Allegheny Forest Expt. Sta. Anthracite Survey Paper 5. 21 pp. [Processed.]

(5) MESAVAGE, CLEMENT.
1942. VOLUME TABLES FOR COMMERCIAL TIMBER IN THE ANTHRACITE REGION OF PENNSYLVANIA. Allegheny Forest Expt. Sta. Anthracite Survey Paper 4. 27 pp., illus. [Processed.]

(6) UNITED STATES BUREAU OF THE CENSUS.
1943. SIXTEENTH CENSUS OF THE UNITED STATES, 1940. Population III (5). Washington, D. C.

(7) ———
1942. SIXTEENTH CENSUS OF THE UNITED STATES, 1940. Manufactures 1939, II (1). Washington, D. C.

(8) ———
1943. SIXTEENTH CENSUS OF THE UNITED STATES. 1940. Population II (6). Washington, D. C.

(9) ———
1942. SIXTEENTH CENSUS OF THE UNITED STATES. 1940. Agriculture, 3 v. Washington, D. C.

(10) WYOMING VALLEY CHAMBER OF COMMERCE.
REPORTS OF THE INDUSTRIAL FORESTER. Wilkes-Barre, Pa. 1939–44.

APPENDIX

SURVEY PROCEDURE

The forest survey of the Anthracite Forest Region is the first large-scale survey in which forest area, forest condition, and timber volumes have been estimated in detail directly from aerial photographs. (These estimates were supported by field checks.) Most of the photographs used were made for the Agricultural Adjustment Administration between 1938 and 1940. Contact prints on a scale of 1:20,000 (slightly more than 3 inches per mile) and aerial photo index sheets on a scale of 2 inches per mile were used.

Forest Area Estimates

Forest areas were estimated from aerial photo index sheets on which the minor civil-division boundaries had been delineated. This was done by means of celluloid overlays marked with small evenly spaced dots. The overlays were placed over the index sheets, and the dots falling on forest and nonforest areas within each civil division were counted. The forest area was figured by applying the proportion of dots falling on forest area to the gross area of the civil division as given by the 1940 Census of Agriculture.

The number of dots or samples taken within each civil division was designed to yield forest area estimates within ±10 percent based on two standard errors. Celluloid grids with adequate numbers of dots per square inch were used to assure attaining this standard. Empirical checks indicate that the statistical accuracy of the sampling method used is considerably better for forest area estimates than random sampling using the same number of samples.

Interpretation of forest areas on the aerial photo index sheets may be less accurate than the range of error indicated statistically. Reference was made to the contact prints in cases of doubtful interpretation, and the forest area estimates were carefully checked by more than one individual. Because the county forest area figures are the summation of those for minor civil divisions they are probably more accurate.[12] Records were also made of the number of samples falling in tracts less than 10 acres in size, those 10 to 50 acres, and those 50 acres and over. The proportion of the samples falling in each classification were applied to the forest area figures to obtain the respective acreages.

Mine-waste areas were estimated through the use of acreage grids. Cropland and water areas were determined from the 1940 census.

Planimetric base maps were prepared from United States Geological Survey quadrangles or State highway department maps showing the principal roads and highways, streams, lakes, and cities and towns. Land use maps were prepared from these by superimposing forest areas of 3 acres and larger, mine waste banks, open land, and urban areas.[13]

---

[12] Detailed county estimates are given in the following publications

NORTHEASTERN FOREST EXPERIMENT STATION.

1945. THE FOREST SITUATION IN PIKE AND MONROE COUNTIES. Northeast. Forest Expt. Sta. Anthracite Survey Paper 7. 31 pp., [illegible] [Processed.]

———

1945. THE FOREST SITUATION IN DAUPHIN AND LEBANON COUNTIES. Northeast Forest Expt. Sta. Anthracite Survey Paper 8. 30 pp., illus. [Processed.]

———

1946. THE FOREST SITUATION IN SCHUYLKILL AND CARBON COUNTIES. N[illegible]east. Forest Expt. Sta. Anthracite Survey Paper 9. 34 pp., illus. [Processed.]

———

1946. THE FOREST SITUATION IN WYOMING AND SULLIVAN COUNTIES. N[illegible]east. Forest Expt. Sta. Anthracite Survey Paper 10. 29 pp., illus. [Processed.]

———

1946. THE FOREST SITUATION IN NORTHUMBERLAND, COLUMBIA AND MONTOUR COUNTIES. Northeast. Forest Expt. Sta. Anthracite Survey Paper 11. 38 pp., illus. [Processed.]

———

1946. THE FOREST SITUATION IN LUZERNE AND LACKAWANNA COUNTIES. Northeast. Forest Expt. Sta. Anthracite Survey Paper 12. 32 [illegible] illus. [Processed.]

———

1946. THE FOREST SITUATION IN WAYNE AND SUSQUEHANNA [illegible] Northeast. Forest Expt. Sta. Anthracite Survey P[illegible] illus. [Processed.]

[13] Land use maps (scale, 1 inch=1 mile) are available [illegible] ties in the Anthracite Forest Region. They may [illegible] Forest Service, Division of Engineering, Washington 25, D. C.

Forest Types

Forest types were mapped by field reconnaissance, supplemented by the use of aerial photographs. Automobile reconnaissance was employed to map areas available from roads, while reconnoitering by foot was used for mapping types in areas not visible from roads. Aerial photographs helped in the delineation of type boundaries. Summer-exposed photographs were used in the delineation of scrub oak areas. Some winter photographs were available for use in separating conifers and hardwoods for a portion of the region; field checks were made to determine species.

Fourteen forest types were recognized within the region but only seven of these were found in areas large enough to justify mapping for this report. The areas dominated by these seven types include small areas of other types.

Forest Condition Classification

All saw-timber and pole-timber stands 10 acres and larger were delineated on aerial photo contact prints by means of stereoscopic examination. All such stands estimated to have 2,000 board feet or more (International ¼-inch rule) on each acre were classified as saw-timber stands; those other stands having at least 400 cubic feet on each acre, or 5 cords, were classified as pole-timber stands. All other stands were considered as unmerchantable. Estimates of volume per acre were made by determining the average height of trees and the average number per acre for each stand and applying a volume table based on total height. Tree heights were estimated from aerial photos by measuring shadows cast by trees on level ground and multiplying these measurements by the tangent of the angle of the sun's rays with the earth at the particular moment the picture was exposed. The number of trees per acre was estimated by counting the visible crowns contained within ⅕-acre templets placed on the photographs.

Maps showing the location of each saw-timber and pole-timber stand 10 acres and larger and the unmerchantable stands were prepared for each of eight counties: Lackawanna, Pike, Monroe, Schuykill, Northumberland, Montour, Dauphin, and Lebanon.[14] Tabulations were also prepared of the area, estimated volume per acre, and the estimated total volume of each merchantable stand.

Volume Estimates

Volume estimates for each saw-timber and pole-timber stand were made for these eight counties and the sum of these was used for total county volumes within these condition classes. Estimates were made from aerial photographs in board feet for saw-timber stands and in cubic feet for pole-timber stands. Forty check tracts ranging from 10 to 500 acres were cruised in the field for each of the first 3 counties and 40 for the remaining 5, a total of 160 tracts equally apportioned among saw-timber and pole-timber stands. Intensity of cruises varied from 50 to 5 percent, the greater intensity in the smaller areas. These indicated that the volume-per-acre estimates from the aerial photographs were within 20 percent of the field check 8 times out of 10 and that as a result of compensating errors the total estimate for each group of 20 tracts was within ±5 percent of the field check.

Cruise data from the check tracts were used as a basis for estimating the volume of the understory in saw-timber stands and the volume of saw timber in pole-timber stands. Empirical estimates were made of volumes in the unmerchantable areas.

Species Composition and Diameter-Class Distribution

Stand and stock tables showing the numbers of trees and the cubic-foot and board-foot volumes of each species for each of the major forest types and condition classes were compiled from systematically selected field data. The records for 50 ⅕-acre sample plots in each of the major forest type and condition classes, distributed among the counties on the basis of the relative occurrence of the classification area, were used. The resulting stand and stock tables were used as a basis for allocating volume data to the various species and species groups and to diameter classes. Local board-foot and cubic-foot volume tables were developed for the trees of the Anthracite Forest Region.

Growth Determination

Measurements for growth calculations were obtained from increment borings made in the line-plot survey, supplemented by additional borings. The growth rates for a 10-year period by species and 2-inch classes were determined mathematically, and class movements were computed. Survival ratios were first applied to the present stand and stock tables; then class-movement percentages were computed to project stand and stock tables for 10 years hence. The ratio of volumes in the projected tables to volumes in the present tables represented the net increase in volume in 10 years due to growth for each type and condition. From compound-interest tables the current annual percentage growth was determined. The percentages thus obtained were applied directly to the inventory volumes of the respective forest types and condition classes to determine their current annual growth. Growth for the entire forest area of the region was found by a summation of the individual growth figures by types and conditions.

---

[14] These maps may be ordered from the U. S. Forest Service, Division of Engineering, Washington 25, D. C.

Drain Estimates

Estimates of commodity drain were made by sampling the wood-utilization industries. The figures obtained by the Forest Service in the lumber-production census of 1942 were used as the average annual lumber drain. Annual round mine-timber drain was obtained by applying factors of cubic feet of wood required per ton of coal produced to the total annual production of deep-mined coal in each coal field. These factors were based on measurements and weights of mine timbers used by several coal companies in each coal field.

Annual fuel-wood and fence-post consumption figures were based on a stratified sample of the farm and rural nonfarm dwellings. The annual drain by the secondary wood-utilization industries was determined by a survey of the factories in the region.

A rough estimate of noncommodity drain was based on the average annual acreage of forest land burned over for the period 1933 to 1942. Losses due to insects and disease were compensated in calculation of growth.

Natural Economic Subregions

The use of aerial photographs in forest surveys simplified the compilation of data on subregions. The areas of each of the major forest types and condition classes within the subregions were compiled from the forest-type and condition-class maps and aerial photographs. Average volumes per acre were applied to these areas to obtain total volume figures. Growth estimates were similarly prepared.

Forest-Land Ownership

A survey was made to determine the ownership of forest land. The area under Federal jurisdiction was obtained from supervising agencies. The State department of forests and waters provided the figures for State forests and county and community ownership. County records were consulted on coal-company lands. An estimate of the area owned by water-supply companies was derived from a sample. Farm woodland acreage was compiled from the 1940 Census of Agriculture.

Employment Outlook

An appraisal was made of the employment outlook in the region by three groups of counties: coal-producing, rural, and industrial (Dauphin-Lebanon). Future population and the numbers in the prospective labor forces were estimated for 1950 and 1960. A detailed explanation of the procedure followed in estimating the prospective labor force is given in Anthracite Survey Paper 6, Northeastern Forest Experiment Station, 1945.

DEFINITIONS OF TERMS USED

Land-Use Classes

Forest land.—Land that is now covered by trees or shrubs, including abandoned farm land that appears (on the photographs) to be at least 50 percent covered by this kind of vegetation.

Cropland.—Land defined by the United States Bureau of the Census as cropland harvested, crop failure, or cropland (idle or fallow).

Mine waste.—Land that has been either covered by mine refuse material from deep mining or disturbed by surface-mining operations.

Water.—Permanent water surfaces such as lakes, reservoirs, and ponds that have an area of 40 acres or more, and streams one-eighth of a mile or more in width.

Other.—Other nonforest areas include urban areas, power, rail, and highway rights-of-way, water areas less than 40 acres in size, and pasture land—open farm land that is not classified as cropland.

Diameter Classifications

Diameter at breast height (d. b. h.).—Diameter, outside bark, measured at 4.5 feet above average ground level.

Diameter class.—Trees were recorded in 2-inch diameter classes, each class including all trees measuring 1.0 inches below and 0.9 inches above the midpoint of the class. For example, the 6-inch class included all trees whose d. b. h. fell in the range of 5.0 inches to 6.9 inches inclusive.

Forest Conditions

Saw-timber stands.—Stands of 10 acres or larger, each acre of which bears a minimum volume of 2,000 board feet. Saw-timber volume is measured in conifers 9.0 inches d. b. h. and over and in hardwoods 11.0 inches d. b. h. and over.

Pole-timber stands.—Stands of 10 acres or larger, each acre of which bears a minimum of 5 standard cords in trees 5.0 inches d. b. h. and over and less than 2,000 board feet of saw timber.

Unmerchantable stands.—Young-growth areas of forest land that have less than 5 standard cords of wood on each acre in the trees 5.0 inches d. b. h. and over, plus saw-timber and pole-timber stands that are less than 10 acres in extent.

Volume Estimates

Saw-timber volume.—The saw-timber portion of sawlog-size trees. Top diameters vary with the limits of usable material. The International ¼-inch log rule (derived from the formula $V=0.796D^2-1.375D-1.230$) was used. Board-foot volumes so derived closely approximate green lumber tally. Deductions were made for cull.

Cubic-foot volume.—The gross volume, including bark, of all trees 5.0 inches d. b. h. and over. This embraces the following:

1. The sawlog portion of sawlog-size trees.
2. The limbs and tops of sawlog-size trees to an approximate 4-inch diameter.
3. The full stems to an approximate 4-inch top diameter of trees under sawlog size.

Cordwood volume.—This volume was derived from the cubic-foot volume by applying a factor of 85 cubic feet per cord for conifers and 75 cubic feet per cord for hardwoods. The standard cord (4 feet by 4 feet by 8 feet) was the unit of volume measurement used.

Tons.—The total cubic-foot volume was converted to short tons (green weight) by applying average cubic-feet-per-ton factors to the volumes of the various species groups. These factors were: 46.3 for the conifer group; 32.9 for the oaks, hickory, and sugar maple group; and 38.2 for the other hardwoods group.

Growth

Growing stock.—The sum of the total volumes of all sound, living trees 5.0 inches d. b. h. and larger.

Forest increment.—The net increase in volume of wood produced on the growing stock after allowance for normal losses due to wind, insects, disease, and crowding; for the merchantable forest it includes the volume of stands attaining the requirements of each class during the year.

Drain

Commodity drain.—The volume of material utilized from trees 5.0 inches d. b. h. and larger plus measurable volume in felled trees left unutilized.

Drain due to fire.—The volume of material in trees 5.0 inches d. b. h. and larger destroyed by fire.

Tree Species

SOFTWOODS

Lumber or trade name	*Recognized common name*	*Botanical name*
Cedar, red	Eastern red cedar	*Juniperus virginiana*
Cedar, white	Northern white-cedar	*Thuja occidentalis*
Hemlock	Eastern hemlock	*Tsuga canadensis*
Pine, southern yellow	Pitch pine	*Pinus rigida*
	Virginia pine	*P. virginiana*
Pine, white	Eastern white pine	*P. strobus*
	Red pine	*P. resinosa*
Spruce, eastern	Black spruce	*Picea mariana*
	Red spruce	*P. rubens*

Tree Species—Continued

HARDWOODS

Lumber or trade name	*Recognized common name*	*Botanical name*
Ash	White ash	*Fraxinus americana*
Aspen	Cottonwood	*Populus deltoides*
	Bigtooth aspen	*P. grandidentata*
	Quaking aspen	*P. tremuloides*
Basswood	American basswood	*Tilia americana*
Beech	American beech	*Fagus grandifolia*
	American hornbeam	*Carpinus caroliniana*
Birch	Gray birch	*Betula populifolia*
	Paper birch	*B. papyrifera*
	Sweet birch	*B. lenta*
	Yellow birch	*B. lutea*
	River birch	*B. nigra*
Cherry	Black cherry	*Prunus serotina*
	Pin cherry	*P. pensylvanica*
Chestnut	American chestnut	*Castanea dentata*
Dogwood	Flowering dogwood	*Cornus florida*
Elm	American elm	*Ulmus americana*
Gum, black	Black tupelo	*Nyssa sylvatica*
Hickory	Pignut hickory	*Carya glabra*
	Mockernut hickory	*C. tomentosa*
Ironwood	Eastern hophornbeam	*Ostrya virginiana*
Locust	Black locust	*Robinia pseudoacacia*
Locust, clammy	Clammy locust	*R. viscosa*
Maple, hard	Sugar maple	*Acer saccharum*
Maple, soft	Red maple	*A. rubrum*
Mulberry	Red mulberry	*Morus rubra*
	Black oak	*Quercus velutina*
Oak, red	Eastern red oak	*Q. borealis* var. *maxima*
	Northern red oak	*Q. borealis*
	Pin oak	*Q. palustris*
	Scarlet oak	*Q. coccinea*
Oak, scrub	Bear oak	*Q. ilicifolia*
Oak, white	Chestnut oak	*Q. montana*
	White oak	*Q. alba*
Poplar, yellow	Yellow-poplar	*Liriodendron tulipifera*
Sassafras	Sassafras	*Sassafras albidum*
Sycamore	American sycamore	*Platanus occidentalis*
Walnut	Butternut	*Juglans cinerea*
	Black walnut	*J. nigra*
Willow	Black willow	*Salix nigra*
	Crack willow	*S. fragilis*

SUPPLEMENTARY TABLES

Table 22.—*Species composition of the major forest types, in percent of gross cubic volume for each type*

Species	Sugar maple-beech-yellow birch	Aspen-gray birch-pin cherry	White pine-hemlock	White pine-white oak-red oak	Red oak-black oak-white oak	Chestnut oak	Scrub oak	Other types
	Percent	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
White pine	0.2	....	24.8	27.3	0.8	5.8	....	1.6
Hemlock	11.0	0.1	35.6	2.4	2.1	9.1	....	1.4
Pitch pine	....	1.5	.2	1.3	3.5	2.2	30.0	4.6
Other conifers	(1)	....	.7	(1)	....	....	....	4.4
Red oak	1.2	....	3.3	23.6	36.2	13.5	10.0	4.6
White oak	.2	....	3.0	21.9	29.2	4.0	10.0	3.4
Chestnut oak	....	....	1.6	9.6	12.5	48.7	10.0	....
Sugar maple	16.4	.6	3.3	1.0	.4	.1	....	....
Hickory	.5	4.6	.3	2.1	2.1	1.5	....	1.7
Red maple	14.8	36.7	11.8	3.9	4.5	6.2	15.0	26.5
Birch	11.2	.2	7.7	1.5	1.2	4.2	5.0	18.0
Beech	18.2	1.1	2.2	.2	.3	....	....	....
Black cherry	5.6	4.6	1.0	.3	.3	....	....	2.2
Ash, basswood	12.4	....	2.5	1.7	3.3	.7	....	1.3
Aspen	3.1	39.8	1.3	1.7	3.0	3.0	10.0	6.3
Other hardwoods	5.2	10.8	.7	1.5	.6	1.0	10.0	24.0

[1] Negligible.

Table 23.—*Net board-foot volume in merchantable saw-timber stands, by diameter class and species group*

Diameter breast high (inches)	Conifers		Oaks, hickory, sugar maple		Other hardwoods		All species	
	M bd. ft.	*Percent*	*M bd. ft.*	*Percent*	*M bd. ft.*	*Percent*	*M bd. ft.*	*Percent*
10	33,200	12.5	....	....	....	....	33,200	4.0
12	44,900	16.9	32,200	15.6	85,700	23.5	162,800	19.4
14	43,600	16.4	37,800	18.3	86,400	23.7	167,800	20.0
16	37,800	14.2	31,300	15.1	67,100	18.4	136,200	16.3
18	32,100	12.0	26,300	12.7	50,400	13.8	108,800	13.0
20	22,600	8.5	20,400	9.8	30,300	8.3	73,300	8.7
22 and up	52,100	19.5	59,000	28.5	44,800	12.3	155,900	18.6
Total	266,300	100.0	207,000	100.0	364,700	100.0	838,000	100.0

Table 24.—*Gross cubic volume (including bark) in merchantable pole-timber stands, by diameter class and species group*

Diameter breast high (inches)	Conifers		Oaks, hickory, sugar maple		Other hardwoods		All species	
	M cu. ft.	*Percent*	*M cu. ft.*	*Percent*	*M cu. ft.*	*Percent*	*M cu. ft.*	*Percent*
6	9,630	17.9	30,410	19.9	61,880	28.6	101,920	24.1
8	14,690	27.3	42,600	27.8	70,790	32.7	128,080	30.2
10	11,890	22.1	34,110	22.3	47,390	21.9	93,390	22.1
12	9,440	17.6	22,490	14.7	21,480	9.9	53,410	12.6
14 and up	8,090	15.1	23,350	15.3	14,960	6.9	46,400	11.0
Total	53,740	100.0	152,960	100.0	216,500	100.0	423,200	100.0

TABLE 25.—*Net board-foot volume, by principal species and condition class*

Species	Saw-timber stands		Pole-timber stands		Unmerchantable stands		All stands	
	M bd. ft.	*Percent*	*M bd. ft.*	*Percent*	*M bd. ft.*	*Percent*	*M bd. ft.*	*Percent*
Conifers:								
White pine	101, 500	12. 2	38, 900	9. 1	145, 600	16. 8	286, 000	13. 4
Hemlock	160, 000	19. 1	46, 600	11. 0	139, 000	16. 0	345, 600	16. 1
Pitch pine	2, 900	. 3	17, 100	4. 0	15, 500	1. 7	35, 500	1. 7
Other	1, 900	. 2	100	(1)	300	(1)	2, 300	. 1
Total, all conifers	266, 300	31. 8	102, 700	24. 1	300, 400	34. 5	669, 400	31. 3
Hardwoods:								
Red oak	63, 800	7. 6	48, 300	11. 3	98, 300	11. 3	210, 400	9. 9
White oak	46, 400	5. 5	29, 900	7. 0	164, 800	18. 9	241, 100	11. 3
Chestnut oak	19, 900	2. 4	19, 700	4. 6	33, 000	3. 8	72, 600	3. 3
Sugar maple	74, 200	8. 9	44, 100	10. 4	52, 700	6. 0	171, 000	8. 0
Hickory	2, 700	. 3	8, 000	1. 9	3, 200	. 3	13, 900	. 6
Total	207, 000	24. 7	150, 000	35. 2	352, 000	40. 3	709, 000	33. 2
Red maple	64, 200	7. 7	35, 300	8. 3	33, 800	3. 9	133, 300	6. 2
Birch	48, 100	5. 7	9, 200	2. 2	44, 500	5. 1	101, 800	4. 8
Beech	146, 200	17. 4	45, 100	10. 6	69, 000	7. 9	261, 300	12. 3
Black cherry	48, 500	5. 8	18, 600	4. 4	9, 200	1. 1	76, 300	3. 6
Ash, basswood	43, 800	5. 2	53, 400	12. 5	27, 400	3. 1	124, 600	5. 8
Aspen	8, 400	1. 0	8, 400	2. 0	27, 900	3. 2	44, 700	2. 1
Other	5, 500	. 7	3, 100	. 7	7, 600	. 9	16, 200	. 7
Total	364, 700	43. 5	173, 100	40. 7	219, 400	25. 2	757, 200	35. 5
Total, all hardwoods	571, 700	68. 2	323, 100	75. 9	571, 400	65. 5	1, 466, 200	68. 7
All species	838, 000	100. 0	425, 800	100. 0	871, 800	100. 0	2, 135, 600	100. 0

[1] Negligible.

TABLE 26.—*Gross cubic volume (including bark), by principal species and condition class*

Species	Saw-timber stands		Pole-timber stands		Unmerchantable stands		All stands	
	M cu. ft.	*Percent*	*M cu. ft.*	*Percent*	*M cu. ft.*	*Percent*	*M cu. ft.*	*Percent*
Conifers:								
White pine	26, 040	8. 8	18, 380	4. 3	59, 830	9. 0	104, 250	7. 5
Hemlock	41, 610	14. 1	28, 860	6. 9	46, 400	7. 0	116, 870	8. 4
Pitch pine	900	. 3	6, 450	1. 5	7, 870	1. 2	15, 220	1. 1
Other	900	. 3	50	(1)	290	(1)	1, 240	. 1
Total, all conifers	69, 450	23. 5	53, 740	12. 7	114, 390	17. 2	237, 580	17. 1
Hardwoods:								
Red oak	23, 510	8. 0	41, 760	9. 9	123, 810	18. 6	189, 080	13. 8
White oak	17, 380	5. 9	28, 760	6. 8	107, 830	16. 2	153, 970	11. 1
Chestnut oak	8, 490	2. 9	32, 120	7. 6	39, 640	6. 0	80, 250	5. 8
Sugar maple	26, 100	8. 7	45, 270	10. 6	31, 240	4. 7	102, 610	7. 4
Hickory	3, 150	1. 1	5, 050	1. 2	9, 080	1. 4	17, 280	1. 2
Total	78, 630	26. 6	152, 960	36. 1	311, 600	46. 9	543, 190	39. 3
Red maple	35, 210	11. 9	58, 900	14. 0	61, 830	9. 3	155, 940	11. 4
Birch	23, 720	8. 0	33, 340	7. 9	37, 600	5. 7	94, 660	6. 8
Beech	43, 010	14. 7	43, 300	10. 2	35, 510	5. 3	121, 820	8. 8
Black cherry	13, 700	4. 6	14, 070	3. 3	12, 810	1. 9	40, 580	2. 9
Ash, basswood	18, 860	6. 4	46, 760	11. 0	32, 290	4. 9	97, 910	7. 1
Aspen	3, 390	1. 1	13, 420	3. 2	31, 520	4. 7	48, 330	3. 5
Others	9, 430	3. 2	6, 710	1. 6	27, 340	4. 1	43, 480	3. 1
Total	147, 320	49. 9	216, 500	51. 2	238, 900	35. 9	602, 720	43. 6
Total, all hardwoods	225, 950	76. 5	369, 460	87. 3	550, 500	82. 8	1, 145, 910	82. 9
All species	295, 400	100. 0	423, 200	100. 0	664, 890	100. 0	1, 383, 490	100. 0

[1] Negligible.

TABLE 27.—*Net volume in each major forest type, by condition class*

SAWLOG MATERIAL

Forest type	Merchantable stands				Unmerchantable stands		All stands	
	Saw timber		Pole timber					
	M bd. ft.	*Percent*	*M bd. ft.*	*Percent*	*M bd. ft.*	*Percent*	*M bd. ft.*	*Percent*
Sugar maple-beech-yellow birch	375, 000	44. 8	182, 700	42. 9	309, 500	35. 4	867, 200	40. 6
Aspen-gray birch-pin cherry	...	...	2, 100	. 5	2, 300	. 3	4, 400	. 2
White pine-hemlock	244, 000	29. 1	39, 900	9. 4	102, 100	11. 7	386, 000	18. 1
White pine-white oak-red oak	100, 900	12. 0	81, 700	19. 2	197, 600	22. 7	380, 200	17. 8
Red oak-black oak-white oak	108, 900	13. 0	103, 500	24. 3	236, 100	27. 1	448, 500	21. 0
Chestnut oak	7, 100	. 8	14, 600	3. 4	15, 500	1. 8	37, 200	1. 7
Scrub oak	...	...	...	...	4, 000	. 5	4, 000	. 2
Other	2, 100	. 3	1, 300	. 3	4, 700	. 5	8, 100	. 4
Total	838, 000	100. 0	425, 800	100. 0	871, 800	100. 0	2, 135, 600	100. 0

OTHER MATERIAL

Forest type	Merchantable stands				Unmerchantable stands		All stands	
	Saw timber		Pole timber					
	Tons	*Percent*	*Tons*	*Percent*	*Tons*	*Percent*	*Tons*	*Percent*
Sugar maple-beech-yellow birch	2, 247, 100	46. 1	5, 432, 100	55. 4	4, 589, 300	30. 7	12, 268, 500	41. 4
Aspen-gray birch-pin cherry	...	...	67, 100	. 7	635, 700	4. 3	702, 800	2. 4
White pine-hemlock	1, 165, 000	23. 9	844, 900	8. 6	884, 500	5. 9	2, 894, 400	9. 8
White pine-white oak-red oak	611, 700	12. 5	1, 314, 500	13. 4	3, 410, 800	22. 8	5, 337, 000	18. 0
Red oak-black oak-white oak	793, 700	16. 3	1, 936, 300	19. 8	4, 743, 300	31. 7	7, 473, 300	25. 2
Chestnut oak	46, 400	1. 0	195, 100	2. 0	428, 900	2. 9	670, 400	2. 3
Scrub oak	...	...	...	...	150, 300	1. 0	150, 300	. 5
Other	11, 300	. 2	13, 800	. 1	107, 600	. 7	132, 600	. 4
Total	4, 875, 200	100. 0	9, 803, 800	100. 0	14, 950, 300	100. 0	29, 629, 300	100. 0

ALL MATERIAL

Forest type	Merchantable stands				Unmerchantable stands		All stands	
	Saw timber		Pole timber					
	M cu. ft.	*Percent*	*M cu. ft.*	*Percent*	*M cu. ft.*	*Percent*	*M cu. ft.*	*Percent*
Sugar maple-beech-yellow birch	132, 990	45. 1	228, 070	53. 9	211, 870	31. 8	572, 930	41. 4
Aspen-gray birch-pin cherry	...	...	3, 000	. 7	25, 620	3. 9	28, 620	2. 1
White pine-hemlock	81, 040	27. 4	41, 160	9. 7	50, 960	7. 7	173, 160	12. 5
White pine-white oak-red oak	37, 280	12. 6	62, 720	14. 8	159, 610	24. 0	259, 610	18. 8
Red oak-black oak-white oak	40, 810	13. 8	78, 690	18. 6	189, 040	28. 4	308, 540	22. 3
Chestnut oak	2, 570	. 9	8, 860	2. 1	17, 120	2. 6	28, 550	2. 1
Scrub oak	...	...	...	...	5, 950	. 9	5, 950	. 4
Other	710	. 2	700	. 2	4, 720	. 7	6, 130	. 4
Total	295, 400	100. 0	423, 200	100. 0	664, 890	100. 0	1, 383, 490	100. 0

TABLE 28.—*Distribution of forest area in each subregion, by forest type and condition class*

COAL FIELDS

Forest type	Merchantable stands		Unmerchantable stands	All stands
	Saw timber	Pole timber		
	Acres	*Acres*	*Acres*	*Acres*
Sugar maple-beech-yellow birch	200	3,000	17,800	21,000
Aspen-gray birch-pin cherry			6,800	6,800
White pine-hemlock	200	500	2,200	2,900
White pine-white oak-red oak	1,000	4,300	44,600	49,900
Red oak-black oak-white oak	3,300	16,700	161,300	181,300
Chestnut oak	200	2,900	38,400	41,500
Scrub oak			99,000	99,000
Other				
Total	4,900	27,400	370,100	402,400

FARMING AREAS

Forest type	Saw timber	Pole timber	Unmerchantable stands	All stands
Sugar maple-beech-yellow birch	53,400	175,700	309,800	538,900
Aspen-gray birch-pin cherry		100	3,500	3,600
White pine-hemlock	26,100	33,500	66,500	126,100
White pine-white oak-red oak	16,400	72,200	364,100	452,700
Red oak-black oak-white oak	13,900	56,900	277,700	348,500
Chestnut oak	400	3,200	37,000	40,600
Scrub oak			6,600	6,600
Other	400	700	5,700	6,800
Total	110,600	342,300	1,070,900	1,523,800

EXTENSIVE FORESTS

Forest type	Saw timber	Pole timber	Unmerchantable stands	All stands
Sugar maple-beech-yellow birch	29,100	136,600	197,100	362,800
Aspen-gray birch-pin cherry		6,500	81,200	87,700
White pine-hemlock	17,500	23,900	76,100	117,500
White pine-white oak-red oak	5,600	19,300	127,800	152,700
Red oak-black oak-white oak	8,800	49,200	327,400	385,400
Chestnut oak	900	8,900	23,900	33,700
Scrub oak			125,900	125,900
Other		400	6,100	6,500
Total	61,900	244,800	965,500	1,272,200

TABLE 29.—*Net board-foot volume in each subregion, by forest type and condition class*

COAL FIELDS

Forest type	Merchantable stands		Unmerchantable stands	All stands
	Saw timber	Pole timber		
	M bd. ft.	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*
Sugar maple-beech-yellow birch	800	2, 300	8, 600	11, 700
Aspen-gray birch-pin cherry	...	...	200	200
White pine-hemlock	1, 300	400	1, 000	2, 700
White pine-white oak-red oak	4, 500	3, 500	12, 900	20, 900
Red oak-black oak-white oak	13, 600	14, 000	42, 600	70, 200
Chestnut oak	600	2, 800	6, 100	9, 500
Scrub oak	...	...	1, 400	1, 400
Other	...	...	...	...
Total	20, 800	23, 000	72, 800	116, 600

FARMING AREAS

Forest type	Saw timber	Pole timber	Unmerchantable stands	All stands
Sugar maple-beech-yellow birch	240, 800	101, 500	196, 400	538, 700
Aspen-gray birch-pin cherry	...	100	100	200
White pine-hemlock	144, 900	23, 800	59, 100	227, 800
White pine-white oak-red oak	72, 800	61, 500	147, 900	282, 200
Red oak-black oak-white oak	57, 100	47, 400	103, 300	207, 800
Chestnut oak	1, 200	3, 100	6, 000	10, 300
Scrub oak	...	...	100	100
Other	2, 100	800	2, 700	5, 600
Total	518, 900	238, 200	515, 600	1, 272, 700

EXTENSIVE FORESTS

Forest type	Saw timber	Pole timber	Unmerchantable stands	All stands
Sugar maple-beech-yellow birch	133, 400	78, 900	104, 500	316, 800
Aspen-gray birch-pin cherry	...	2, 000	2, 000	4, 000
White pine-hemlock	97, 800	15, 700	42, 000	155, 500
White pine-white oak-red oak	23, 600	16, 700	36, 800	77, 100
Red oak-black oak-white oak	38, 200	42, 100	90, 200	170, 500
Chestnut oak	5, 300	8, 700	3, 400	17, 400
Scrub oak	...	...	2, 500	2, 500
Other	...	500	2, 000	2, 500
Total	298, 300	164, 600	283, 400	746, 300

TABLE 30.—*Gross cubic volume (including bark) in each subregion, by forest type and condition class*

COAL FIELDS

Forest type	Merchantable stands		Unmerchantable stands	All stands
	Saw timber	Pole timber		
	M cu. ft.	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*
Sugar maple-beech-yellow birch	280	2, 130	5, 880	8, 290
Aspen-gray birch-pin cherry	...	...	1, 780	1, 780
White pine-hemlock	400	350	640	1, 390
White pine-white-oak red oak	1, 680	2, 590	11, 130	15, 400
Red oak-black oak-white oak	5, 100	10, 700	35, 520	51, 320
Chestnut oak	230	1, 710	6, 730	8, 670
Scrub oak	...	...	2, 080	2, 080
Other	...	...	...	...
Total	7, 690	17, 480	63, 760	88, 930
FARMING AREAS				
Sugar maple-beech-yellow birch	85, 390	127, 110	133, 900	346, 400
Aspen-gray birch-pin cherry	...	50	990	1, 040
White pine-hemlock	49, 270	24, 610	25, 320	99, 200
White pine-white oak-red oak	26, 820	47, 170	116, 750	190, 740
Red oak-black oak-white oak	21, 390	36, 060	78, 400	135, 850
Chestnut oak	510	1, 880	6, 700	9, 090
Scrub oak	...	...	170	170
Other	710	400	2, 440	3, 550
Total	184, 090	237, 280	364, 670	786, 040
EXTENSIVE FORESTS				
Sugar maple-beech-yellow birch	47, 320	98, 830	72, 090	218, 240
Aspen-gray birch-pin cherry	...	2, 950	22, 850	25, 800
White pine-hemlock	31, 370	16, 200	25, 000	72, 570
White pine-white oak-red oak	8, 780	12, 960	31, 730	53, 470
Red oak-black oak-white oak	14, 320	31, 930	75, 120	121, 370
Chestnut oak	1, 830	5, 270	3, 690	10, 790
Scrub oak	...	...	3, 700	3, 700
Other	...	300	2, 280	2, 580
Total	103, 620	168, 440	236, 460	508, 520

TABLE 31.—*Net board-foot volume in each subregion by species group and condition class*

Subregion	Saw-timber stands				Pole-timber stands				Unmerchantable stands			
	Conifers	Oaks, hickory, sugar maple	Other hard-woods	All species	Conifers	Oaks, hickory, sugar maple	Other hard-woods	All species	Conifers	Oaks, hickory, sugar maple	Other hard-woods	All species
SAWLOG MATERIAL												
	M bd. ft.	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*M ft. bd.*	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*
Coal fields	3, 900	12, 000	4, 900	20, 800	6, 100	13, 500	3, 400	23, 000	16, 800	45, 700	10, 300	72, 800
Farming areas	166, 200	122, 800	229, 900	518, 900	69, 400	91, 000	77, 800	238, 200	190, 100	191, 800	133, 700	515, 600
Extensive forests	96, 200	72, 200	129, 900	298, 300	38, 400	64, 900	61, 300	164, 600	93, 500	114, 500	75, 400	283, 400
Total	266, 300	207, 000	364, 700	838, 000	113, 900	169, 400	142, 500	425, 800	300, 400	352, 000	219, 400	871, 800
OTHER MATERIAL												
	Tons	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Coal fields	13, 000	89, 100	35, 300	137, 400	53, 800	286, 200	74, 100	414, 100	114, 600	1, 120, 300	297, 400	1, 532, 300
Farming areas	585, 500	925, 000	1, 521, 000	3, 031, 500	588, 800	2, 104, 700	2, 775, 800	5, 469, 300	928, 600	4, 258, 800	2, 845, 800	8, 033, 200
Extensive forests	330, 800	522, 200	853, 300	1, 706, 300	302, 700	1, 528, 400	2, 089, 300	3, 920, 400	511, 700	2, 640, 900	2, 232, 200	5, 384, 800
Total	929, 300	1, 536, 300	2, 409, 600	4, 875, 200	945, 300	3, 919, 300	4, 939, 200	9, 803, 800	1, 554, 900	8, 020, 000	5, 375, 400	14, 950, 300
ALL MATERIAL												
	M cu. ft.	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*
Coal fields	970	4, 560	2, 160	7, 690	3, 060	11, 170	3, 250	17, 480	7, 720	43, 070	12, 970	63, 760
Farming areas	43, 760	47, 340	92, 990	184, 090	33, 470	82, 140	121, 670	237, 280	69, 740	166, 110	128, 820	364, 670
Extensive forests	24, 720	26, 730	52, 170	103, 620	17, 210	59, 650	91, 580	168, 440	36, 930	102, 420	97, 110	236, 460
Total	69, 450	78, 630	147, 320	295, 400	53, 740	152, 960	216, 500	423, 200	114, 390	311, 600	238, 900	664, 890

TABLE 32.—*Drain on the forests of each subregion by class of material, 1943*

Type of drain	Sawlog Material				Other Material				All Material			
	Coal fields	Farming areas	Extensive forests	Total	Coal fields	Farming areas	Extensive forests	Total	Coal fields	Farming areas	Extensive forests	Total
	M bd. ft.	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*Tons*	*Tons*	*Tons*	*Tons*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*
Mine timber	1, 220	39, 620	26, 760	67, 600	9, 900	281, 500	198, 300	489, 700	500	15, 530	10, 490	26, 520
Sawmill	400	43, 040	25, 560	69, 000	900	79, 900	51, 400	132, 200	80	8, 610	5, 110	13, 800
Farm fuel	10	2, 500	190	2, 700	600	110, 700	8, 400	119, 700	20	4, 450	330	4, 800
Fence posts	....	100	....	100	....	7, 400	300	7, 700	....	290	10	300
Nonfarm fuel	10	910	80	1, 000	300	40, 500	4, 100	44, 900	10	1, 630	160	1, 800
Other commodity	50	3, 250	1, 700	5, 000	300	6, 200	3, 200	9, 700	10	650	340	1, 000
Noncommodity	1, 250	60	980	2, 290	73, 900	5, 000	69, 000	147, 900	2, 720	190	2, 660	5, 570
Total	2, 940	89, 480	55, 270	147, 690	85, 900	531, 200	334, 700	951, 800	3, 340	31, 350	19, 100	53, 790

TABLE 33.—*Growth in the major forest types of each subregion, by forest condition and class of material, 1943*

SAWLOG MATERIAL

Forest type	Coal fields				Farming areas			
	Saw-timber stands	Pole-timber stands	Unmerchantable stands	All stands	Saw-timber stands	Pole-timber stands	Unmerchantable stands	All stands
	M bd. ft.	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*
Sugar maple-beech-yellow birch	40	160	570	770	10, 910	8, 100	15, 120	34, 130
Aspen-gray birch-pin cherry	....	....	10	10	....	110	10	120
White pine-hemlock	420	200	650	1, 270	6, 110	1, 740	4, 060	11, 910
White pine-white oak-red oak	220	220	810	1, 250	3, 080	4, 380	9, 990	17, 450
Red oak-black oak-white oak	210	760	2, 570	3, 540	2, 510	3, 010	6, 220	11, 740
Chestnut oak	20	120	260	400	30	160	290	480
Scrub oak			80	80	....	....	10	10
Other	....	....	....	....	80	60	180	320
All types	910	1, 460	4, 950	7, 320	22, 720	17, 560	35, 880	76, 160
ALL MATERIAL								
	M cu. ft.	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*
Sugar maple-beech-yellow birch	13	13	439	465	3, 315	8, 014	9, 730	21, 059
Aspen-gray birch-pin cherry	....	1	109	110	....	3	67	70
White pine-hemlock	16	19	40	75	1, 584	1, 377	1, 681	4, 642
White pine-white oak-red oak	62	149	828	1, 039	849	2, 782	9, 322	12, 953
Red oak-black oak-white oak	160	584	3, 075	3, 819	569	2, 075	7, 338	9, 982
Chestnut oak	4	74	507	585	8	85	565	658
Scrub oak	....	....	141	141	....	....	12	12
Other	....	....	....	....	21	24	200	245
All types	255	840	5, 139	6, 234	6, 346	14, 360	28, 915	49, 621

SAWLOG MATERIAL

Forest type	Extensive forests				Total, region			
	Saw-timber stands	Pole-timber stands	Unmerchantable stands	All stands	Saw-timber stands	Pole-timber stands	Unmerchantable stands	All stands
	M bd. ft.	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*
Sugar maple-beech-yellow birch	6, 400	6, 860	7, 300	20, 560	17, 350	15, 120	22, 990	55, 460
Aspen-gray birch-pin cherry	....	10	160	170	....	120	180	300
White pine-hemlock	4, 350	1, 290	2, 650	8, 290	10, 880	3, 230	7, 360	21, 470
White pine-white oak-red oak	1, 120	1, 380	2, 370	4, 870	4, 420	5, 980	13, 170	23, 570
Red oak-black oak-white oak	1, 740	3, 020	5, 610	10, 370	4, 460	6, 790	14, 400	25, 650
Chestnut oak	120	500	160	780	170	780	710	1, 660
Scrub oak	....	....	150	150	....	....	240	240
Other	10	30	180	220	90	90	360	540
All types	13, 740	13, 090	18, 580	45, 410	37, 370	32, 110	59, 410	128, 890
ALL MATERIAL								
	M cu. ft.	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*
Sugar maple-beech-yellow birch	2, 088	6, 296	4, 839	13, 223	5, 416	14, 323	15, 008	34, 747
Aspen-gray birch-pin cherry	....	143	1, 468	1, 611	....	147	1, 644	1, 791
White pine-hemlock	1, 174	926	1, 515	3, 615	2, 774	2, 322	3, 236	8, 332
White pine-white oak-red oak	332	780	2, 051	3, 163	1, 243	3, 711	12, 201	17, 155
Red oak-black oak-white oak	443	1, 861	6, 669	8, 973	1, 172	4, 520	17, 082	22, 774
Chestnut oak	34	246	307	587	46	405	1, 379	1, 830
Scrub oak	....	....	271	271	....	....	424	424
Other	3	17	171	191	24	41	371	436
All types	4, 074	10, 269	17, 291	31, 634	10, 675	25, 469	51, 345	87, 489

TABLE 34.—*Inventory change of board-foot volume in each subregion between Jan. 1, 1943, and Jan. 1, 1944, by condition class*

Item	Coal fields				Farming area			
	Saw-timber stands	Pole-timber stands	Unmerchantable stands	All stands	Saw-timber stands	Pole-timber stands	Unmerchantable stands	All stands
	M bd. ft.	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*
Inventory of Jan. 1, 1943	20, 800	23, 000	72, 800	116, 600	518, 900	238, 200	515, 600	1, 272, 700
Drain:								
Commodity drain	950	680	60	1, 690	48, 530	31, 290	9, 600	89, 420
Noncommodity drain	50	250	950	1, 250	10	....	50	60
Total	1, 000	930	1, 010	2, 940	48, 540	31, 290	9, 650	89, 480
Increment:								
Growth on stands remaining in original condition class	890	1, 410	4, 720	7, 020	21, 680	15, 820	31, 860	69, 360
Growth prior to drain on stands cut or burned	20	30	30	80	1, 040	1, 100	340	2, 480
Volume of stands shifting to higher condition class	580	3, 010	....	3, 590	8, 000	51, 450	....	59, 450
Growth on these stands	20	200	....	220	640	3, 680	....	4, 320
Less volume of these stands	....	−580	−3, 010	−3, 590	....	−8, 000	−51, 450	−59, 450
Volume of stands shifting to lower condition class	....	....	....	....	....	....	....	....
Total	1, 510	4, 070	1, 740	7, 320	31, 360	64, 050	−19, 250	76, 160
Net change	510	3, 140	730	4, 380	−17, 180	32, 760	−28, 900	−13, 320
Inventory of Jan. 1, 1944	21, 310	26, 140	73, 530	120, 980	501, 720	270, 960	486, 700	1, 259, 380

Item	Extensive forests				Total, region			
	Saw-timber stands	Pole-timber stands	Unmerchantable stands	All stands	Saw-timber stands	Pole-timber stands	Unmerchantable stands	All stands
	M bd. ft.	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*	*M bd. ft.*
Inventory of Jan. 1, 1943	298, 300	164, 600	283, 400	746, 300	838, 000	425, 800	871, 800	2, 135, 600
Drain:								
Commodity drain	29, 950	21, 360	2, 980	54, 290	79, 430	53, 330	12, 640	145, 400
Noncommodity drain	40	250	690	980	100	500	1, 690	2, 290
Total	29, 990	21, 610	3, 670	55, 270	79, 530	53, 830	14, 330	147, 690
Increment:								
Growth on stands remaining in original condition class	13, 050	11, 910	17, 720	42, 680	35, 620	29, 140	54, 300	119, 060
Growth prior to drain on stands cut or burned	690	810	120	1, 620	1, 750	1, 940	490	4, 180
Volume of stands shifting to higher condition class	4, 590	20, 660	....	25, 250	13, 170	75, 120	....	88, 290
Growth on these stands	370	740	....	1, 110	1, 030	4, 620	....	5, 650
Less volume of these stands	....	−4, 590	−20, 660	−25, 250	....	−13, 170	−75, 120	−88, 290
Volume of stands shifting to lower condition class	....	....	....	....	....	....	....	....
Total	18, 700	29, 530	−2, 820	45, 410	51, 570	97, 650	−20, 330	128, 890
Net change	−11, 290	7, 920	−6, 490	−9, 860	−27, 960	43, 820	−34, 660	−18, 800
Inventory of Jan. 1, 1944	287, 010	172, 520	276, 910	736, 440	810, 040	469, 620	837, 140	2, 116, 800

TABLE 35.—*Inventory change in cubic-foot volume in each subregion between Jan. 1, 1943, and Jan. 1, 1944, by condition clas*

Item	Coal fields				Farming area			
	Saw-timber stands	Pole-timber stands	Unmerchantable stands	All stands	Saw-timber stands	Pole-timber stands	Unmerchantable stands	All stands
	M. cu. ft.	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*Mcu. ft.*	*M cu. ft.*
Inventory of Jan. 1, 1943	7, 690	17, 480	63, 760	88, 930	184, 090	237, 280	364, 670	786, 040
Drain:								
Commodity drain	280	300	40	620	12, 880	12, 820	5, 460	31, 160
Noncommodity drain	30	180	2, 510	2, 720	10	30	150	190
Total	310	480	2, 550	3, 340	12, 890	12, 850	5, 610	31, 350
Increment:								
Growth on stands remaining in original condition class	250	814	5, 006	6, 070	5, 901	13, 604	27, 362	46, 867
Growth prior to drain on stands cut or burned	5	10	81	96	209	277	166	652
Volume of stands shifting to higher condition class	355	1, 712	....	2, 067	6, 630	22, 736	....	29, 366
Growth on these stands	15	52	....	67	292	1, 387	....	1, 679
Less volume of these stands	....	−355	−1, 712	−2, 067	....	−6, 630	−22, 736	−29, 366
Volume of saw-timber stands shifting to lower condition class	....	2	26	28	....	456	2, 125	2, 581
Growth on these stands	....	....	....	....	....	34	202	236
Less volume of these stands	−28	....	....	−28	−2, 581	....	....	−2, 581
Volume of pole-timber stands shifting to lower condition class	....	....	46	46	....	....	1, 960	1, 960
Growth on these stands	....	....	1	1	....	....	187	187
Less volume of these stands	....	−46	....	−46	....	−1, 960	....	−1, 960
Total	597	2, 189	3, 448	6, 234	10, 451	29, 904	9, 266	49, 621
Net change	287	1, 709	898	2, 894	−2, 439	17, 054	3, 656	18, 271
Inventory of Jan. 1, 1944	7, 977	19, 189	64, 658	91, 824	181, 651	254, 334	368, 326	804, 311

TABLE 35.—*Inventory change in cubic-foot volume in each subregion between Jan. 1, 1943, and Jan. 1, 1944, by condition class*—Continued

Item	Extensive forests				Total, region			
	Saw-timber stands	Pole-timber stands	Unmerchantable stands	All stands	Saw-timber stands	Pole-timber stands	Unmerchantable stands	All stands
	M cu. ft.	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*	*M cu. ft.*
Inventory of Jan. 1, 1943	103, 620	168, 440	236, 460	508, 520	295, 400	423, 200	664, 890	1, 383, 490
Drain:								
Commodity drain	7, 120	7, 530	1, 790	16, 440	20, 280	20, 650	7, 290	48, 220
Noncommodity drain	40	230	2, 390	2, 660	80	440	5, 050	5, 570
Total	7, 160	7, 760	4, 180	19, 100	20, 360	21, 090	12, 340	53, 790
Increment:								
Growth on stands remaining in original condition class	3, 790	9, 750	16, 427	29, 967	9, 941	24, 168	48, 795	82, 904
Growth prior to drain on stands cut or burned	134	167	126	427	348	454	373	1, 175
Volume of stands shifting to higher condition class	3, 922	12, 102	....	16, 024	10, 907	36, 550	....	47, 457
Growth on these stands	165	738	....	903	472	2, 177	....	2, 649
Less volume of these stands	....	−3, 922	−12, 102	−16, 024	....	−10, 907	−36, 550	−47, 457
Volume of saw-timber stands shifting to lower condition class	....	451	1, 229	1, 680	....	909	3, 380	4, 289
Growth of these stands	....	34	116	150	....	68	317	385
Less volume on these stands	−1, 680	....	....	−1, 680	−4, 289	....	....	−4, 289
Volume of pole-timber stands shifting to lower condition class	....	....	1, 992	1, 992	....	....	3, 998	3, 998
Growth on these stands	....	....	187	187	....	....	376	376
Less volume of these stands	....	−1, 992	....	−1, 992	....	−3, 998	....	−3, 998
Total	6, 331	17, 328	7, 975	31, 634	17, 379	49, 421	20, 689	87, 489
Net change	−829	9, 568	3, 795	12, 534	−2, 981	28, 331	8, 349	33, 699
Inventory of Jan. 1, 1944	102, 791	178, 008	240, 255	521, 054	292, 419	451, 531	673, 239	1, 417, 189

○